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# NATIONAL SBIR PHASE III COMMERCIALIZATION CONFERENCE

Federal Interagency Conferences  
for Small High-Technology  
Companies

June 10 and 11, 1993

IN

Orlando, Florida

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13. ABSTRACT (Maximum 200 words) <p>The Small Business Innovation Research Phase III Conference, 10-11 June 1993, was organized to foster partnerships between the most successful SBIR firms and other small businesses, major corporations, venture capitalists, and technical representatives of Federal organizations. This document, provided to participants, describes the capabilities and goals of over 160 of the companies that were represented at the conference. Participating small companies all have been successful in developing technically innovative products and processes under the Federal SBIR program. Goals of the SBIR program include stimulating technological innovation, strengthening the role of small business in meeting Federal R&amp;D needs, encouraging participation by minority and disadvantaged firms, and increasing the commercial application of Federally-supported research and development results. Conference attendees included: 75 major corporations, 233 small businesses, and 17 venture capitalists.</p>				
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# Schedule of Events

## Day One Program

Robert Wrenn - Conference Chairman, SBIR Coordinator DoD

8:00 AM	Continental Breakfast
9:00 AM	Welcome - Greg Farmer, Florida Secretary of Commerce.
9:15 AM	Sample presentations of technology interests by large companies, venture capitalists, Government technical people.
12:00 Noon	Lunch
1:30 PM	Display prototypes, posterboards, one-on-ones, 3 concurrent technical presentations.
5:30 PM	Reception
7:00 PM	Concurrent workshops: Panel 1: Developing partnerships Panel 2: Contract & auditing issues after Phase II

## Day Two Program

8:00 AM	Breakfast
9:00 AM	Display prototypes, posterboards, one-on-ones, 3 concurrent technical presentations.
12:00 Noon	Lunch
1:30 PM	Display prototypes, posterboards, one-on-ones, 3 concurrent technical presentations.

## Day Three Program

8:30 AM	Wrap-up discussion for Phase II awardees and Government technical people with Robert Wrenn.
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## Phase II Awardees

DTIC QUALITY INSPECTED 2

Acctek Associates, Inc.

Distribution /

901 S. Kensington  
LaGrange, IL 60525  
Tel (708) 252-6786  
Fax (708) 252-4007

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Ronald L. Martin, President  
R. Bart Clare, Consultant

ACCTEK Associates was formed to develop and market equipment for medical applications of protons in hospital settings. These applications include radiation treatment of cancer, proton radiography and computed tomography, and PET isotope production.

Under an initial Phase II grant from the National Cancer Institute, ACCTEK developed prototype magnets and vacuum chambers for a synchrotron designed to accelerate H ions to 250 MeV for cancer treatment. The concept was for an accelerator that was simple, reliable, and inexpensive. Costs of the prototype equipment verified the low cost aspects of this concept. Under a second Phase II grant from NCI, ACCTEK developed and successfully tested both a rotating vertical beam delivery system, which is a low cost alternative to an isocentric gentry, and a fast raster scanning beam system which will allow 3 dimensional dose localization to the tumor. A third area under development is the use of protons for diagnostic applications of radiography and computed tomography. The significant fundamental advantages of protons over x-rays for this purpose were demonstrated at physics laboratories in the 1970s, but with data acquisition rates too low to be useful in a hospital setting. In a Phase I grant ACCTEK demonstrated a very fast acquisition rate on a 200 MeV proton beam, thus guaranteeing success in this development. A proposal for Phase II funding has been submitted. This entire line of development has the potential for containing the cost of utilizing protons in hospitals so that their use can become much more widespread than would otherwise be the case.

The significant advantages of ACCTEK's concepts need to be demonstrated to the interested medical community. Such a demonstration would also highlight their low cost. Raster scanning beam delivery for therapy will require demonstration of its performance and safety before it can be approved for use on patients. Development of the entire system for proton radiography and computed tomography beyond the Phase II stage may be required to make it the significant tool it will surely become.

ACCTEK would like to partner with a larger organization interested in the long range development of accelerator applications in general, and the medical applications described above in particular. ACCTEK would expand its technical staff to a) be capable of carrying out the design and cost study of

medical facilities in response to RFP's from any of the several institutions presently considering this possibility, b) design, construct, and operate facilities for the demonstrations and development described above, and c) carry out R&D on additional applications of this technology. The facilities might be part of a CRADA (Cooperative Research And Development Agreement) with Argonne National Laboratory (or other laboratory) and/or the result of a grant under the NIST or ATP programs. The partner organization would provide financial support for the demonstrations, and administrative and marketing support for the partnership.

### Accurate Automation Corp.

7001 Shallowford Road  
Chattanooga, TN 37421-1716  
Tel (615) 894-4646  
Fax (615) 894-4645

Robert M. Pap, President  
Reba L. Pap, Director of Administration  
Chadwick Cox

Company Purpose and Goals: Develop neural network applications for signal processing, control, fault diagnosis and hardware as well as software.

Accurate Automation will demonstrate our Neural Network Toolbox. Applications like flight controls, robotics, and radar processing will be shown. Our fault diagnosis system for cryogenic, mechanical systems and electronics will be shown. A neural network UME and pc ISA board is being developed.

We are licensing our neural network library and hardware to other companies. We are doing joint ventures with leaders in their field to apply neural networks to real world problems.

### Adaptive Technology, Inc. (ATEK)

309 Curtis Street  
Syracuse, NY 13208  
Tel (315) 475-1121  
Fax (315) 472-3279

Donald R. Miedaner, President

Adaptive Technology, Inc. is involved in the development of innovative radar and communication technology. Its areas of expertise encompass space-based radar technology, electromagnetic analysis, microwave imaging and sensor modeling to computer system integration and the development of custom designed hardware and software.

Space-Time Adaptive Research (STAR) System - flexible and modular signal generation and processing instrumentation system, whose specific applica-

tion is airborne radar test support, was developed. This system includes: (a) high-fidelity digital time-sample signal data generation software that simulates a radar phased array antenna, with arbitrary translational and rotational motion, interacting with a complex signal environment containing moving targets, clutter and jamming, (b) a real-time, multi-channel, microwave signal generation system that is driven by digital time-sample data provided by (a), and (c) a digital real-time, multi-channel signal processor driven by microwave signal inputs, provided by a radar under test or by (b). STAR, implemented in a VME environment, utilizes fifteen TMS320C30 DSPs as the basic real-time processing elements. It has a real-time, high-resolution color display. STAR supports radar flight testing and increases engineering productivity through (1) real-time, in-flight processing, (2) operator-assisted intelligent data acquisition, (3) flying a planned flight test in the computer, and (4) data interpretation through comparison with simulated data. Planned improvements include: (1) Upgrade to a VXI/VME environment, (2) higher-quality A/D conversion at 5 MHz and 12-bits, (3) add twelve TMS320C40 DSPs (each rated at 40 MFlops), (4) add four LH9124 processors (each rated at approximately 500 MFlops), (5) add four X-band receivers, and (6) add four X-band upconverters.

### Advanced Communication Systems, Inc.

1900 N. Beauregard Street, Suite 300  
Alexandria, VA 22311  
Tel (703) 553-4389  
Fax (703) 820-8435

George A. Robinson, President  
Tom Costello, Senior Vice President  
Chuck Martinache, Executive Vice President  
Jim Mazzei, Chief Technology Officer  
Bassem Girgis, Software Engineering

It is the mission of ACS to provide engineering technical support and business management consulting in the fields of communication and business management consulting in the fields of communication and information systems technology to clients in both the public and private sectors.

#### Voice Subscriber Terminal:

The Department of the Navy's Communication Support Systems (CSS) is a layered, open system architecture which provides voice, message, and data communications among ships and aircraft of the battle force, and between the battle force and shore commands. The CSS permits the users to share total network capacity on a priority basis in accordance with the current communications plan. The Voice Subscriber Terminal (VST) provides all hardware and software functions necessary to interface a voice user to the CSS network.

The CCS provides data exchange network protocols. The goal is to extend these data exchange network protocols to include the ability to establish, con-

duct and terminate point-to-point and conference vocoded voice calls. The Phase II SBIR provides all functions necessary to process incoming and outgoing half-duplex voice calls over the CSS network. The VST consists of an advanced narrowband digital voice terminal (ANDVT) providing all vocoder functions, a SUN workstation for user interface, and a VME card to provide network interface.

The ability for fleet or command center data and voice users to share available network capacity will increase communication flexibility and survivability.

Intelligent RDT&E Management Information System (Expert Librarian)

ACS Developed a prototype Windows based software application which duplicates the effort of a librarian in assisting an individual in locating desired information. The Expert Librarian applies expert systems technology to the problem of finding information in several large databases. The application directs intelligent interaction between the technology manager or other user and the database. A request by the user for specific subject information initializes the application of rules in the expert system and generates a search for information in the database. Once data is retrieved, it is analyzed for relevance, evaluated for possible insertion potential, and presented in graphical form to the user. A specific application of the Expert Librarian is interconnecting with the Defense Technical Information Center (DTIC) Direct On Line System (DROLS). The user selects a single subject and the system interacts with him or her to determine what specific report or study contains the required information. After that information is obtained the user connects to DTIC and requests the report. On-line costs are therefore minimized.

A central repository of Expert Librarian data, enhanced by expert system technology will assist technology managers in accessing databases quickly and inexpensively.

Non-Developmental Item (NDI) Software Application to Undersea Warfare Systems.

Several NDI C41 software applications have been identified which process various surveillance sensor message and broadcast data non organic to the Integrated Undersea Surveillance System (IUSS) community. This Small Business Innovative Research (SBIR) effort proposed to tailor, modify, and integrate the above application functions into a standard IUSS UNIX based workstation environment; i.e., the DTC-2 version 4/110 upgraded to a 4/300. This integrated workstation will permit IUSS to better receive, display, evaluate, and manage non-organic surveillance resources. Additional functions include communication interfaces, selectable filters, message parsing, geographic displays, and supporting data bases. The Phase II technical objectives are as follows:

- Tailor the selected NDI software application functionality for the IUSS environment;
- Delete irrelevant functions where possible and add new functionality where necessary;
- Integrate and test the NDI application with selected external communications links and with the IUSS internal communications command and control interfaces;

- Provide NDI VME based TRE processing capability as required to support testing; and
- Install and test at the NRIAD IUSS Development Facility; Field Test at an IUSS facility.

Efforts will also be made to configure initialization macros, automated alerts/alarms and other functions that minimize operator learning time and maximize the degree of automated operation. Automatic on-line database comparisons will be conducted between IUSS contacts and non-organic contacts to try and determine mismatches. All new functions will be interoperable with existing NDI software and IUSS data structures, human - machine interfaces and inter-process communications techniques.

Principal benefits will be to provide improved cueing to the IUSS sensors for wider input to the Joint Surveillance picture.

### Advanced Motion Controls, Inc.

518 W. Water St., P.O. Box 64  
Princeton, WI 54968  
Tel (414) 295-3500  
Fax (414) 295-3504

George H. Holling, President

Company Purpose and Goal: To manufacture innovative control technology.

The project will continue development with state-of-the-art miniature servo amplifier. Three implementations will be performed and compared: Surface mount technology (SMT) projected 0.8 cubic inches; hybrid technology expected volume 0.55 cubic inches; and "smart power" integration expected volume 0.4 cubic inches.

The development will focus on the application of liquid cooling technology to achieve ultra high power densities. The devices will incorporate innovative minimum component count circuitry technology, which has been successfully developed and tested during Phase I of this project.

The project will attempt to integrate the servo amplifier into the actuator. This will significantly reduce the required number of interconnects and improve the systems reliability, noise and radiated energy output. Finally, integrated feedback sensors and an intelligent peripheral.

### Advanced Refractory Technologies, Inc.

699 Hertel Avenue  
Buffalo, NY 14207  
Tel (716) 875-4091  
Fax (716) 875-0106

Keith A. Blakely, President  
Steven C. Martin, Executive Vice President  
Donald J. Bray, Director of Technology Development

Company Purpose and Goals: To provide high performance non-oxide ceramic materials - powders, whiskers, fibers, and components - to industrial, automotive, aerospace, nuclear, and electronics companies

ART has developed a continuous process for manufacturing ultrafine, high purity metal and ceramic powders. The technology utilizes a chemical flame approach which is commercially scalable and offers outstanding economic potential. The purity and fineness of the flame-synthesized materials cannot be easily achieved by any other commercial technologies.

The process appears to have broad applicability to making a variety of non-oxide ceramics, metals, alloys, blends, and composites of each. The process has already been demonstrated for silicon nitride powders with an average size of less than 0.3 microns, as well as tantalum and niobium powders of submicron size.

Some work is needed in further improving overall yield and throughput.

ART envisions collaborative arrangements to further optimize the process technology for specific materials or compounds with individual companies. This may be achieved through licensing arrangements, continued development contracts, or joint manufacturing ventures. The nature of the arrangement will depend heavily on the current match between ART's technology and production capability in a given material and the market requirements for that material.

### Advanced Surface Technology, Inc.

9 Linnell Circle  
Billerica, MA 01821-3902  
Tel (508) 663-7652  
Fax (508) 663-7746

Dr. Ih-Houng Loh, President/CEO  
Dr. Alan B. Fischer, Director, R&D  
Mr. David M. Hudson, Operation Manager

The Company was founded for the advancement of biomaterials technology. Its mission is to become the leader in surface technology by offering the biomedical industry state-of-the-art biocompatible coatings thereby improving medical device performance.

The objective of this Phase II SBIR research was to develop an adherent polymeric coating for neural prosthetic implants. The coating must exhibit the following characteristics: No degradation in the presence of an electric field; be thin enough to allow for use with microelectronics; retain biocompatibility within the human body; and function reliably over the lifetime of an implant recipient.

The commercial application of this research will result in the implementation of a new coating process: Plasma-enhanced parylene coating (PEP) (US Patent Pending). A wide variety of applications are envisioned within the biomedical and industrial markets:

- Biomedical: Improved biosensors & electronics, packaging materials, orthopedics, and other implantable devices.
- Industrial: Improve corrosion protection of steel, aluminum, copper and other metals
- Military: Barrier coating against chemical warfare agents
- Electronic: Environmental protection of electronic circuit boards

Additional application specific biological testing data is required for FDA regulatory needs in biomedical applications. Engineering scale-up is required for large-volume contract manufacturing.

Commercialization Strategies: 1) License the technology, 2) perform contract manufacturing (coating services), and 3) manufacture custom-designed process reactor.

AST is looking for 1) a joint venture partner to develop PEP coating for specific applications, and 2) manufacturing partner to fabricate large-volume PEP coater

## ADVEC Corporation

P.O. Box 1248  
Los Alamos, NM 87544  
Tel (505) 662-6146  
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D.S. Pappas, M.Sci., President  
G.H. McCall, Ph.D., Chief Scientist  
G.W. York, Ph.D., Research Division Leader  
W.B. Lewis, Ph.D., Principal Investigator  
W.K. Brown, Ph.D., Senior Scientist

ADVEC Corporation focuses on novel high payoff defense, energy, transportation, telecommunication and safety and environmental technologies from concept formulation through manufacturing and marketing.

ADVEC has produced the design and hardware for proof of principle of a novel compact high energy laser for modern defense applications. This system is presently being tested at ADVEC's laboratories for a number of additional commercial applications including: 1) Compact, low fuel inventory, fail-safe 100 MW nuclear reactor requiring no rotating machinery for electric power production for utility and propulsion applications, 2) adaptation for use in producing novel fiber optic sensors for superconducting magnet quench detection systems, non-intrusive large area security systems, and for use in first-alert electrical fire detection systems for installation in large building complexes, 3) test vehicle for larger volume liquefied rare gas high energy phys-

ics detectors, and 4) prototype for "four states of matter" university physics laboratory educational training tool.

Laser and reactor concepts need field testing of the equipment, which we have developed. Fiber optic sensor is near product packaging stage. High energy physics detector and lab teaching instrument require modest testing and product packaging.

ADVEC scientists have begun development of a number of novel technologies, some of which are listed above that could have national and international market exceeding \$10EXP9.

We are primarily interested in organizations interested in working with ADVEC to develop these systems into real products by investing capital and marketing resources.

## Airex Corporation

Route 108  
Dover, NH 03820  
Tel (603) 742-3703  
Fax (603) 742-0977

Richard D. Sedgewick, President  
James C. Sedgewick, General Manager  
David Carroll, Design Engineer  
Michael O. Drew, Manufacturing Engineer

Company Purpose and Goals: To provide technological development for dual-use application of innovative electronic control systems and high reliability magnetic components.

A SmartCard<sup>TM</sup> motion control system has been created that provides Windows<sup>®</sup> based development and production capability for many programmable motion control sequences. The system was developed to extend the application of a new automated winding platform for high reliability magnetic components to fiber optic and composite fiber winding tasks.

SmartCards<sup>TM</sup> control stepping motors in open or closed loop configurations, as well as solenoids and DC motors. They can operate as stand alone controllers or as a network in groups up to 30 cards. Cards can be connected on a common bus to perform control of an individual motion. They are supervised and directed by either a master control program running under Windows<sup>®</sup>, or by a programmable SmartCard<sup>TM</sup> controller. The user friendly system provides real time program generation and WYSIWYG editing of existing programs. It has been described as a flexible, functional, and economical alternative to existing technologies. Each SmartCard<sup>TM</sup> comes with a pre-programmed microprocessor containing proprietary network software.

Feedback features include digital optical encoders that resolve position up to 1000 steps per revolution. Each SmartCard<sup>TM</sup> can also monitor analog data such as temperature, power, position or magnetic field strength while performing motion control duties. Speed is variable by program control.



Further SmartCard™ development is needed only in exploring additional features and/or determining the packaging and combination of features to take to the market. Machine vision, speech recognition, variable ramping, speed/rate control, higher speeds and D.C. servo control are among the key features for future development. The optimal feature combination for marketing each stand-alone card, mini-network or full network model has yet to be determined.

Winding machine development for fiber optics, composite materials or magnetic components is in much the same status. A standardized feature set has been developed and implemented to perform certain high reliability tasks. Capabilities such as speed, process control features or capacity may be added dependent of the SmartCard™ development level and market need.

Commercial opportunities exist in the development and application of the SmartCard™ as an inexpensive (\$30 typical hardware) and extremely versatile motion control system, or as an interface for OEM products in automation technologies. This system has direct application to both. It can be configured as a stand alone, mini-network or full network system. While the driver portion of the PCB is intended for low end applications for steppers, solenoids and D.C. motors, a step and direction output expands control capabilities to sophisticated high end systems. Typical applications may include valve control, machine tools, welders, pick and place robots, fiber optic winding machines, tension devices, process controllers, measurement systems, X-Y tables or future embedded applications such as smart appliances, HVAC controls or any teachable sequenced activity. The issue of patentability is being investigated.

An ideal partner would look to develop SmartCard™ as the dominant interface in motion control software through licensing and OEM guarantees, much the same as Microsoft DOS and now Windows has developed as the predominant user interface to PC's.

### Alternative System Concepts, Inc.

2 Inwood Circle, P.O. Box 694  
Pelham, NH 03076  
Tel (603) 635-3553  
Fax (603) 635-8FAX

Jake Karrfall, President and Principle Investigator  
Bob Stoddard, Technology Transfer Manager  
Casper Stoel, Design Automation Engineer

ASC was established in 1990 to produce design automation tools that provide streamlined test and development processes for electronics product design. Industry's trend toward more use of VHDL as the standard continues to drive ASC toward new testable design tools.

ASC researched high-level synthesis and existing standards including VHSIC Hardware Description Language (VHDL) and boundary scan architecture (IEEE Std-1149.1). Based on these two standards, ASC developed the

VBIT<sup>TM</sup> (VHDL Built-in Test) tool. This is based on dividing abstract design space in a two dimensional plane defined by perpendicular axes, one for design and one for test, each marked in progressively finer steps of engineering detail. Navigating through the environment depicted by the two dimensional plane, designers find the design automation tools easier to understand and use. The circuit designer automatically inserts boundary scan cells and built-in self-test features into the micro-chips. Test circuitry is automatically added to existing system and board level designs populated with custom or commercial off the shelf devices. Manufacturability is improved by good testability. Increasing density of surface mount technology and increasing complexity of VLSI devices place an even greater demand on design-for-test requirements. VHDL supports multi-level design, allowing the VBIT<sup>TM</sup> tool to function as a universal test insertion tool independent of the chip technology. The VBIT<sup>TM</sup> tool is in beta-test and is considered a strategic design tool for new DoD initiatives, including Defense Dual-Use Technology.

Additional Development Needed: Beta testing must be completed. Hierarchical Scan Support (HSS) for the VBIT<sup>TM</sup> product will provide full board level support for boundary scan. ASC provides product integration support using a common user interface to ease interface problems. Using CAD Frameworks Initiative (CFI) support, these problems can be fully alleviated. Additional development can expand the basic product to analog test synthesis with high level synthesis techniques, MHDL and extensions to VHDL.

A joint venture would create a subsidiary corporation or agreement of shared responsibilities and profits. A partnership would share everything 50/50. A strategic alliance would leverage the larger company's installed base and capitalize on the entrepreneurship of the small company. Comparing the three strategies, subject to terms of negotiated agreement:

Item	Joint Venture	Partnership	Strategic Alliance
ASC'S ROLE:			
Equity Investment	0%	50%	100%
Documentation	provides	provides	provides
Product support	provides	provides	provides
VBIT <sup>TM</sup> ownership	yes	yes	yes
Product know-how	yes	yes	yes
Profits	50%	50%	90%
AFFILIATE'S ROLE:			
Equity Investment	100%	50%	0%
Customer list	n/a	n/a	yes
Interface detail	n/a	n/a	yes
Publicity	yes	yes	yes
Product support	provides	provides	no
VBIT <sup>TM</sup> ownership	no	yes	no
Product know-how	no	yes	no
Profits	50%	50%	10%

## Amerasia Technology, Inc.

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Mr. John A. Neal, III, Senior Research Engineer

American Research Corporation of Virginia was formed to conduct research and product development in science and engineering.

American Research Corporation of Virginia is currently pursuing the commercial development and marketing of three proprietary technologies: An All Digital Eddy Current (ADEC) analysis system, an Interactive Documentation Access (IDA) system, and a Visual Programming Language (VPL). The ADEC system is an eddy current measurement technology which does not require analog bridge circuits for analysis, thereby allowing multiple frequency operation of probe arrays. Commercial markets for the ADEC technology can be found in a wide variety of applications ranging from warehouse inventory control to improved chemical sensors. The IDA system is a hyper-media and expert system-based, diagrammatic environment for the presentation of user-configurable, on-line documentation. Commercial markets for this technology can be found in any application where large amounts of documentation are maintained and updated frequently where the system can be used to provide more efficient and more accurate access to large volume documentation databases. The VPL technology is an interactive graphical programming environment which is designed to increase programmer productivity during non-author maintenance of existing code structures and modification of large scale source code files. This technology can be readily applied to industries which maintain complex, large scale process control and database analysis software.

Each of the three technologies outlined in the above abstract is currently implemented as laboratory prototypes and requires further development before being presented to the marketplace. American Research Corporation intends

to pursue this development through internal funding and strategic alliances with other companies.

The ADEC technology will be implemented as a commercial product through internal funding. The IDA technology will also be developed using internal funding and will be marketed as a service company which converts existing "hard copy" documentation to the IDA environment. The VPL programming environment will be brought to the marketplace through a strategic alliance with an established software marketing firm.

## Amron Corporation

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Albert H. Terp, President  
Dr. Stephen S. Lane, Vice President/Principal Scientist  
William Buller, Engineer  
Sarah Steiger, System Manager

Amron Corporation is a small business providing technical support services and products in areas of systems engineering, signal and image processing, and data fusion.

Phase II SBIR: Time Frequency Representation using the Choi-Williams Distribution. The objective of this work is the development of a prototype system to calculate the joint time-frequency distribution of acoustic transients for detection and classification. Spectrographic methods, such as the current Lofogram, cannot discriminate among transients of duration less than or equal to a few integration periods because a transform length short enough to contain adequate signal power is too short to provide good frequency resolution. The Choi-Williams modification of the Wigner-Ville spectrum was shown in Phase I of the present work to overcome this limitation. It also provides a superior pre-filter for a signal detector optimized for transients. The Choi-Williams distribution is superior to other time frequency representations such as the Wigner distribution in that it has the intuitive appeal of these distributions, does not display unwanted artifacts and is expected to have improved resolution in both time and frequency. The tasks are system design, data collection, implementation of previously developed Choi-Williams code on an i860-based vector processor, signal detector development, OMI development, system integration, optimization on real data and performance estimation. We plan to transfer the results to the Surveillance Direction system as part of that system's P3I.

## Analytical Services & Materials, Inc.

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Fax (804) 865-7309

Dr. Jalaiah Unnam, President  
Dr. Siva M. Mangalam, Head, Aeronautics Division

Company Purpose and Goals: Extend the usefulness of R&D efforts with Government agencies through the conversion of innovative ideas into commercially viable products and the creation of new jobs.

AS&M has pursued flow diagnostics capability resulting from R&D efforts with the Government through the development of sensors, instrumentation, and data analysis software for wind-tunnel and flight-test applications. These products, individually and as an integrated system, provide researchers and vehicle (automobile, aircraft, helicopters, ships, and submarines) designers new and powerful tools to obtain quantitative information in real time of flow features that are critical to the optimum performance. These products place AS&M at the forefront of the flow diagnostics capability in the world. The technology resulting from the use of these products will be extensively used in vehicles designed well into the next century.

The current products are generic in nature and require detailed design for specific applications.

There are opportunities for potential joint ventures with major aircraft and shipbuilding companies. Some Japanese manufacturers have shown keen interest in pursuing these products to realize greater benefits with miniaturization, greater quality, reliability, etc. There are specific applications in the active control and monitoring of flight vehicles with the application of these products. Details can be discussed for specific cases.

## Analytical Software Inc.

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Tel (214) 349-5977  
E-mail / MCI Mail 2560458

Mark Haley, President  
Marjorie Haley, Vice President  
Melanie Vega, Manager of E-mail Sales

Analytical Software provides computer related solutions for commercial and government customers. Its primary products consist of telecommunications and multimedia systems, and its newest products combine both technologies.

Boardroom Graphics for Windows is an easy-to-use software package which creates multimedia presentations - combining videos, voice, music, photographs, text charts, and screen captures from any Windows application. This package permits a novice user to create professional multimedia slide shows quickly. Screens can be instantly captured from the Windows clipboard, or text charts can be created within minutes. Moreover, the program includes a word-processor with a spelling checker which can be used to create text charts. Therefore a presentation with screen captures, video, photos, or text charts and music could be easily created within a hour.

Video files can be intermixed throughout a slide show, thereby insuring a stunning presentation - full motion, full screen videos can be displayed anywhere in your presentation. In addition, the program permits 35mm slides to be created from the slide presentation and WYSIWYG printouts provide handouts which exactly reflect the slide presentation. Finally, the program permits the user to create CD ROMs. Boardroom Graphics has been used to create multimedia presentations for both the U.S. Army and the U.S. Marines. In addition, it was used to highlight NCR's/AT&T multimedia PC at the fall 1992 Comdex.

Primary additional development would be for technologies which integrate multimedia and telecommunications thereby providing such technologies as digital video delivered via telephone lines.

There are two areas in which we could work with companies, the federal government or venture capitalists:

Distribution of existing multimedia and telecommunications products: Analytical Software has two existing products: (1) Boardroom Graphics which permits a novice user to create multimedia presentations which include video, voice music, photographs and text charts (see discussion above), and (2) The Executive Assistant provides X.400 worldwide links via MCI or AT&T Mail. Analytical Software supports over 1,000 customers on worldwide networks, which provide electronic mail, faxing, X.400 EDI and connectivity between LANs, PCs and mainframes. As an agent for MCI Mail, Analytical Software has setup numerous electronic mail networks in the U.S. and throughout the world. For example, Nordstrom uses software developed by Analytical Software to send purchase orders, faxes, electronic mail and invoice confirmations in a worldwide electronic mail network. This network links Nordstrom's key suppliers - companies such as Nike, Levi Strauss, American Express, etc. If a corporation, venture capitalist or government agency is interested in financing the marketing of the multimedia or telecommunications technologies discussed above, they are available now and we would be interested in working with them.

Long run development of digital video over communications networks: We are developing technologies for transmission of digital video over communication networks and would be interested in working with companies, venture capitalists and government agencies to develop related products/services.

## ANRO Engineering, Inc.

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Tel (813) 957-3080  
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Dr. Gerald F. Ross, President  
David K. Barton, Vice President  
Dr. Walter K. Kahn, Vice President  
Paul C. Hamilton, Vice President  
Robert W. T. Mulloy, Manager, UWB Programs

ANRO Engineering performs applied research, prototype development, technical analyses, and consulting services in radar, communications, optronics and related fields.

FIBer optic intrusion LOcation (FIBLOC) system: FIBLOC was developed for the Defense Nuclear Agency under a Phase II SBIR program. The sensor employs fiber optic cable techniques to locate the point of intrusion (e.g., within  $\Delta$  meters) and identify the class of intrusion; for example, crawler, walker, runner, or vehicle. The physical basis for the sensor depends on the (phase) sensitive interference phenomena which govern propagation of an off-axis optical/infra-red beam through a graded index fiber. The FIBLOC sensor is designed to be used for either permanent or relocatable deployment, and can be used on or below the ground surface or on a fence. The sensor is designed to protect a perimeter up to 4 km.

NAVY Ultra-Wideband (UWB) Tactical Array: Under a Naval Sea Systems Command Phase II SBIR, ANRO has developed a 10 element linear array capable of producing 100 kilowatts of peak power. The array is comprised of low cost solid-state elements which transmit 1.5 nanosecond pulses at a rate of 10 KHz. The array can be electronically steered using a microprocessor to control time delay by simply varying DC voltages. ANRO has also invented a superheterodyne receiver that provides an 18 dB improvement over a previous binary integrator design. These two critical hardware elements will permit a high resolution UWB radar design that can detect small boats to a range of approximately 25 miles.

Both potential products will need to be upgraded/modified to meet customer specifications.

ANRO prefers to sell license agreements to large business concerns as Phase III partners. The agreements typically include upfront cash and downstream royalty payments.

## Antech, Inc.

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Tel (404) 993-7270  
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Ashok K. Nagrani, President

Antech is a provider of CAD systems and solutions for AEC companies. The company will market a revolutionary surveying device for as-built structures.

ANBILT is a survey tool that can be used to quickly produce CAD drawings of as-built structures and other surveys. It reduces to a single step the process of gathering field data and converting it into a CAD drawing on-site.

Due to the simplicity of design, ANBILT is a very easy instrument to use which provides CAD drawings in less than 25% of the time and expense of conventional methods.

The unit comprises a very accurate electronic angular measuring instrument mounted on a rail. Target points are sighted from two positions on the rail. The point data is fed directly into a CAD drawing resident on a notebook computer. As a result, the operator only has to visually target the point twice, and the coordinates are automatically calculated and drawn within the drawing. The operator can then anoint the point data, build walls between points, or enter door, window or other such data directly into the drawing. Due to the entire system running within a CAD environment, no back shots have to be taken when the instrument is moved to a different location.

ANBILT costs 25% less than total surveying stations, is over three times as fast and can be learned to use in half the time.

With minor modifications to increase producibility and productivity, ANBILT is ready to be marketed. A more advanced version is planned incorporating the use of a HUD laser distance measuring instrument which can measure non-cooperative targets. Currently, the laser does not have the accuracy required by ANBILT, but modifications currently in work in the firmware of the machine will give the desired accuracy.

ANBILT's market will comprise surveyors, space planners, operators, and possibly military operations. The fastest penetration of the market will be achieved by a company that already has established channels of distribution and service to the above markets.

We are looking for a mentor/partner relationship with an established company, preferably in the instruments industry who has established distribution and service channels. The mentor/partner would be responsible for the sales and marketing of the units, while Antech would integrate the units, maintain and improve the software, and carry out on-going development and research. Alternately, the production could be carried out by the mentor/partner if the company has existing production facilities which are capable of producing these units, while Antech would supply the software and interface loaded on a notebook computer.



A company active in the production and marketing of measurement devices for commercial and military applications will find the ANBILT unit an ideal addition to its product offerings with a minimal investment in research and development. In addition, if the company has significant sales to the DoD, a mentoring relationship with Antech would be virtually cost free under DoD's Protégé/Mentor Program.

## APA Optics, Inc.

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Blaine, MN 55449-9998  
Tel (612) 784-4995  
Fax (612) 784-2038

Dr. Anil K. Jain, President  
William Arden, Marketing Manager

APA Optics, Inc. is a technology-oriented firm whose special strengths lie in the exploration of optical and optoelectronic science with an eye towards product development. APA Optics has established an impressive facility and staff of talented personnel to transform these technological innovations into marketable products that will meet or exceed the performance expectation of our customers and the financial expectations of our stakeholders.

At this conference, APA is presenting a compact 2-dimensional binary optics laser scanner/beamsplitter, and a solid-state ultraviolet detector.

The scanner/beamsplitter family (patent applied for) is based on research performed under an SBIR Phase II contract FO8630-92-C-0056 for Eglin AFB. These unique devices provide unprecedented flexibility in the number, direction, shape, and energy distribution of the outgoing beams. They operate in one or two dimensions, with one or many output beams. The scanners use piezoelectric drives and can scan over large angles at frequencies in the range of 100Hz. There are no wearing parts. They will see use in laser printers and readers, inspection systems, and laboratory applications.

The second product is a solid-state ultraviolet radiation detector. It is derived from APA's work in aluminum gallium nitride (AlGaIn) for Wright Patterson AFB on contract F33615-90-C-1454. Covered by several patents, these detectors feature very high, uniform sensitivity in the UV region (up to 365nm) and very low sensitivity outside that region (including the visible and IR). The cutoff wavelength can be tuned by adjusting the AlGaIn composition. They are more rugged than most photomultiplier tubes and less sensitive to extremes of temperature than other solid-state detectors. Applications include flame/fire sensing and instrumentation.

Further development in these product areas will be directed toward specific applications such as LADAR (for the scanner) and fire sensing (for the UV detector), as well as toward large-scale production of these products.

The intent of APA Optics is to supply custom forms of these products directly to original equipment manufacturers (OEM) for inclusion in their products, as

well as to market standard versions through specialized distributors of optical components.

## Applied Pulsed Power, Inc.

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95 Brown Road  
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Tel (607) 257-1971  
Fax (607) 257-5304

Steven C. Glidden, President  
Dr. David Hammer, Secretary  
Daniel Kalantar, Treasurer  
Michael Richter, Engineering Specialist

Applied Pulsed Power, Inc. (APP) was incorporated to develop the X-pinch soft x-ray source for high throughput, .05-.35  $\mu\text{m}$  scale lithography and to develop other commercial applications of pulsed power. APP intends to develop a prototype source and then manufacture the source for, or license the technology to, semiconductor equipment manufacturers.

The microelectronics manufacturing industry will soon demand the capability to produce devices with 0.25 micron ( $\mu\text{m}$ ) feature sizes - beyond the capability of current optical lithography techniques. Soft x-rays can achieve feature sizes in the 0.05 - 0.25 ( $\mu\text{m}$ ) range. X-ray technology is generally believed to be necessary to create the ultra-large scale integration (ULSI) ICs, such as 256 Mbit to 1 Gbit dynamic random access memory (DRAM) chips.

While high energy synchrotrons can generate soft x-rays with the required properties for x-ray lithography, they are very expensive (at least \$20,000,000 plus the cost of a dedicated facility). In addition, reliance on a single synchrotron to support many wafer steppers represents a high risk.

The x-pinch pulsed plasma x-ray source under development at Applied Pulsed Power, Inc., consists of two or more fine wires mounted on the load electrodes of a pulsed power generator in the form of an X which are subjected to a 100 ns, 500,000 A pulse. As a result, the crossing point becomes an extremely bright source of extreme ultraviolet and soft x-ray radiation. The x-pinch has shown itself capable of satisfying the source requirements for high throughput x-ray lithography. It is preferable to synchrotron-based sources based on capital costs and ease of implementation. The X-pinch is superior to other plasma-based soft x-ray sources in throughput, energy efficiency, and cost of ownership.

The capability of the x-pinch source to satisfy the requirements for x-ray lithography has been demonstrated experimentally at Cornell University. Phase I produced a design indicating the engineering feasibility of the source. In Phase II APP is building a demonstration version of the source, whose output characteristics are sufficient for a high throughput x-ray lithography system. The next step is to use this system to explore reliability and lifetime is-

sues while developing a prototype source which can be mounted on a x-ray stepper.

The X-pinch was developed and patented at Cornell University. APP was formed by two of the X-pinch inventors and Steven Glidden, company President, in 1990 to further design and develop the source. APP is currently negotiating with Cornell to obtain exclusive rights to this patent.

The company is seeking funding to accelerate the testing and optimization of the demonstration source and to develop a prototype source which will be mated with an x-ray stepper developed by a lithography system manufacturer. Development of the prototype source would be done in collaboration with the stepper manufacturer to ensure source/stepper compatibility. This collaboration could be a simple agreement to share technical information, or it could be in the form of a joint venture or partnership to develop a complete x-ray lithography system. Potential sources of funds include semiconductor lithography equipment manufacturers, semiconductor manufacturers, non-SBIR DARPA funding (in collaboration with a stepper manufacturer), or other outside investors. In addition, investment in APP could be leveraged by grants from the National Institutes of Standard and Technology's Advanced Technology Program, which covers direct expenses only.

### Applied Technology Associates, Inc.

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Robert Cavalleri, Ph.D., President  
Marichu Cavalleri, Sec-Treasurer

Company Purpose and Goals: Developing compact efficient rotary vane gas compression for air conditioning applications.

A high efficiency, compact but large displacement rotary compressor is being developed. Several machines in the size range from 6 cfm to 600 cfm have been designed or fabricated. This compressor has features incorporated into its design that minimize the amount of internal leakage, decrease internal friction and maximize the compressor displacement for the weight and volume of the compressor. The machine can be used in air conditioning and refrigeration applications with a variety of refrigerants. The refrigerants considered for use with the machines in a vapor cycle are environmentally benign. A second application is as a two stage 600 cfm air compressor. This application will generate 240 psia air for a number of industrial applications.

The benefits of this machine are its simplicity, low fabrication cost and energy efficiency. It can also be used as a vacuum pump or as a solar power generating unit.

Marketing help is needed.

## APTEK, Inc.

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Colorado Springs, CO 80906  
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Thomas F.V. Meagher, President  
Eugene A. Fitzgerald, Vice President

The APTEK design optimization team seeks to help companies develop superior products by effectively integrating software optimization technologies into their design process.

The Customized Optimum Design Evolution (CODE) capability solves complex engineering design problems by integrating analysis software with versatile optimization and advanced visualization technologies. The APTEK CODE team develops integrated software systems to solve client problems, and offers the systems to clients as well as specific solutions.

CODE can be used to optimize any or all aspects of product development to which complex design methods are applied. CODE has successfully completed Phase II SBIR contracts involving complex aerodynamic shape optimization (Air Force, Navy) and 3-D space planning (NASA, Air Force). Other applications include automotive and aircraft design and manufacturing, concurrent engineering, and process control and operations.

Benefits of integrating CODE into current design methodologies include improved product performance, shorter design cycles, and reduced product development costs.

APTEK is interested in providing existing aerodynamic or 3-D space planning design optimization software to users, providing optimized solutions and/or software to a variety of other complex engineering problems, or in forming strategic alliances for additional development and/or selling.

## Artificial Intelligence Research, Inc.

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Tel (913) 832-1444

Dr. Frank M. Brown, President  
Dr. Carlos Araya, Vice President  
Dr. David Leasure, Chief Engineer

The company goal is to build a rapid software development technology using the latest programming and representation language innovations.

Logistica<sup>TM</sup> is a lexically scoped functional programming language used for rapid program development for implementing commonsense reasoning processes. Although at the simplest level Logistica looks like Scheme it differs in two important ways: First, it allows symbols to be bound to any number of

values, and second, it allows symbolic expressions to be the results of evaluation. The consequences of these changes is that automatic backtracking with exhaustive space searching, multiple threaded execution, parallel execution, and pattern matching all become inherent features of normal function application. These differences provide the programmer new and powerful programming metaphors based on a seamless progression of tools, from the straightforward functional programming approach to the powerful and highly descriptive expression of alternative symbolic computations. Logistica provides a rapid development technology more powerful than Apple's new DY-LAN operating system development language for general programming tasks. It is especially effective at implementing sophisticated reasoning processes such as heuristic search, planning, natural language understanding, knowledgebase inference, symbolic reasoning, algebraic and geometric reasoning, inductive reasoning, constraint programming, deductive reasoning, object oriented reasoning, verification and synthesis of programs and designs.

Additional Development Needed: Development of an optimizing compiler. We are looking for the following kinds of partnerships.

- A company having a need to develop software which performs formal or commonsense reasoning tasks such as reasoning about actions, inferring consequences from knowledgebases, and planning. In this case the partner would provide commercialization funds, and an application area, receiving in return both an immediate technological foundation for solving its problems, in addition to other financial arrangements as the commercialized product is sold.
- A computer software/hardware/microelectronics company interested in providing rapid computer software product development capabilities to its customers particularly for tasks involving commonsense reasoning or for its own internal use. In this case the commercialized system or some version of it would be a product of the partner providing it with a new end sales capability. A company working in the area of parallel machines and processes would find this technology especially useful.
- A company specializing in knowledge transference and information highways. In this case the company would use the system as a high level method of expressing sophisticated reasoning processes in such a manner that the information may be easily communicated. In this case the partner would receive a competitively advantageous representation technology.

### AstroPower, Inc.

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Allen M. Barnett, President  
Cheryl E. Keith, Vice President, Director of Operations  
Robert B. Hall, Vice President, Director of Silicon R&D  
Louis C. DiNetta, Director, High Performance Products

Company Purpose and Goals: Production of high performance optoelectronic products fabricated from thin sheets of electronic semiconductor materials including, but not limited to, special detectors, ultra-bright LEDs and high performance space and future terrestrial solar cells.

Epitaxial gallium phosphide based materials are promising for the manufacture of ultraviolet light detectors. Low leakage current and good signal to noise ratios will provide detector sensitivity superior to standard silicon ultraviolet detectors. Due to a large bandgap and exceptional quality, gallium phosphide detectors will also provide superior performance in high temperature, high radiation environments. Determining the intensity and wavelength of ultraviolet light is important in spectrophotometry, astronomy, high-energy physics (Cerenkov radiation), medicine, UV curing, photoresist exposure, sterilization systems, and chemical processing. These detectors also have applications as fire detection sensors, communication receivers in high thermal ambients and as targeting sensors for missile and laser systems.

III-V energy converters optimized for radio luminescent light based power supplies using an "indirect" process in which a phosphor is excited by radioactive decay products to produce light that is then converted to electricity by an energy converter are being developed. This will result in the production of low volume, safe, high voltage, milliwatt power supplied with service life times in excess of 12 years. These "batteries" can be used to fulfill system power requirements such as low level constant power or trickle charge for energy storage devices for burst power requirements. Beta batteries can be used for remote applications and also widespread commercial potential as on-board power supply to maintain non-volatile memory.

Prototypes have been demonstrated.

AstroPower is interested in working with companies on specific applications. It is our intent to supply critical high performance components to original equipment manufacturers.

## Atlantic Aerospace Electronics Corporation

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Fax (617) 890-0224

Dr. Theodore Bially, Vice President, Gen. Mgr.  
Dr. Victor Tom, Group Leader, Algorithm  
Ms. Tami Peli, Director, Infrared Processing  
Mr. H. Jay Ohland, Vice President, Marketing

Atlantic Aerospace has outstanding technical staff capabilities and extensive engineering development tools for creating innovative high technology solutions to meet market needs. We seek to form alliances with industries currently in areas where our technology will allow new and profitable products to be brought to the marketplace. Our goal is to maintain sustained growth of 15 to 20 percent a year.

Atlantic Aerospace has developed an innovative, non-linear signal processing technique based on morphological filtering, that detects military targets or other specified objects in imagery data that is highly cluttered and in which desired targets are characterized by subtle, hard-to-find signatures.

Our Phase II SBIR work is aimed at optimizing and refining the algorithms for operation across a wide range of imagery data, testing the results against government-provided imagery data sets, and developing a prototype real-time processor for use in scanningIRST systems. We have also developed morphology-based texture measures that have been demonstrated to be highly effective for discriminating man-made objects from natural scene features in high resolution SAR, FLIR and Electro-Optic imagery.

The Atlantic approach used algorithms that are much less computationally complex than other methods. We have achieved target detection/discrimination results that are at least as good as, and in many cases significantly better than, the current best techniques in a wide variety of applications domains. The computational simplicity afforded by Atlantic's non-linear approach is directly convertible into major reductions in hardware cost, size, weight and power consumption.

Commercial applications exist in many areas including machine vision, document scanning, airport security and analysis of medical imagery.

Atlantic Aerospace has developed a scalable processor architecture for morphological signal processing that uses an ASIC currently under development with internal funds. Additional development will be needed to optimize the processing algorithms and scale the processor for use with specific platforms, sensors and missions, and to demonstrate real-time processing for a selected application.

Atlantic Aerospace technical strengths are focused in three broad areas: 1) Signal processing, 2) antennas, and 3) surveillance and counter-surveillance systems. In each of these areas we continue to develop relationships with firms currently in the marketplace, in which we jointly respond to market opportunities and/or focus our IR&D investments toward agreed-to market needs.

As a small firm primarily focused on the defense-oriented SBIR and contract research and development business, Atlantic Aerospace is not by itself well positioned to respond to the product-oriented marketplace. We are able, however, due to our primary business focus, to provide a technology base and level of innovation not normally available to many product houses. Our strategy is to form alliances which require a minimum of investment by either party, that will allow us to combine our substantial technological strengths with the market presence and built-in infrastructure of a product-oriented firm.

## Aurora Associates

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Dr. I.D. Chang, Chief Scientist  
Ed Gill, Senior Staff Engineer  
Pheobe Chang, President

Company Purpose and Goals: Product development of optical sensor and signal processing instruments based on proprietary acousto-optic technology. Near-term goals include development of AO tunable filters/spectrometers.

Aurora Associates has four phase II SBIR projects. The objectives of these projects are: (a) Optical IFM-the development of a channelized IFM receiver capable of handling multiple RF signals, (b) Spectral Agile Image Sensor (SAIS) - development of an AOTF based SAIS operated in the infrared, (c) Amplitude Modulated Fiber Sensor (AMFS) - develop effective dual wavelength referencing technique for fiber optic sensors, and (d) Multiplexing Fiber-Optic Smart Sensor (MFOSS) - develop wavelength division multiplexing (WDM) techniques for implementation of smart structures. All these programs are directed to product development of optical sensor and instruments based on Aurora Associates' high performance AO devices. Successful completion of the SBIR programs will result in the following products: (a) Advanced AO devices (modulator, Bragg cells and AOTF), (b) AOTF imaging spectrometer for environmental monitoring, process control and medical application, (c) low power tunable filter for fiberoptic sensor/communication, and (d) AO channelized IFM/Correlator as preprocessor of EW or communication receivers.

The Phase II effort has produced breadboard for hardware demonstration. Additional effort is required to develop cost effective manufacturing process for the product.

The primary strength of Aurora Associates is our capability of providing new AO devices based on our experience and proprietary technical expertise. Dr. I.D. Chang, the chief scientist of Aurora Associates was the inventor of many AO devices including the basic AOTF. Currently Aurora Associates has 2 issued patents and three more are pending. Aurora Associates is interested to seek joint ventures/partnerships with complete system or equipment manufacturers. Since Aurora Associates have full capability in the manufacturing of AO products at device and subsystem level. Aurora Associates will be responsible for the optical sensor (components/subsystem) and the system house will be responsible for the system integration, software and sale.



## Autonomous Technologies Corporation

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Randy Frey, President  
Dick Downes, Vice President  
Dr. James Burkhalter, Principal Scientist

The Company is currently transitioning from DoD and NASA sponsored Research & Development focusing on Tracking Laser Radar Technology to Commercial Development of a proprietary medical laser product.

### Coherent Laser Radar Monopulse Tracker

Optical heterodyne monopulse tracking is an attractive solution for strategic target discrimination and weapon system fire control, rather than depending on adjunct angle tracking systems, but its precision is degraded by laser speckle. Theoretical analysis and simulation results indicate the proposed innovative monopulse signal processing approach would perform well against diffuse targets and produce high precision angle error signals. The hardware implementation of the conceptual design is sufficiently versatile to be compatible with the multiplicity of wave forms that are candidates for the high precision range/doppler measurements required for strategic target discrimination and weapon system fire control.

The objective of the innovative monopulse signal processing approach was to decouple laser speckle from target angle error measurements. The coherent laser radar monopulse signal processing implementation is capable of processing both the amplitude and phase information that is contained in the monopulse return.

The Phase II program has two major activities:

- A detail simulation which addresses both the amplitude and phase aspects of the heterodyne mixing process, complex target signatures, representative acquisition uncertainties due to target/sensor platform dynamics, and angle error algorithm.
- The design and fabrication of a data acquisition sensor and signal processing system used to collect diverse data sets, against a variety of targets, which enable the validation of the simulation, and the Signal Processing Technique.

### LADAR Vision Processor for Rendezvous, Docking and Adaptive Grasping

The LADAR Vision approach to autonomous satellite servicing and assembly allows a logical transition from pre-specified (robotic) and manned EVA to vision-assisted telerobotic and vision-dependent autonomous satellite servicing. This is accomplished by relying on direct measurements of registered geometric parameters (range, velocity and reflectance) for comparison to the shapes, dynamics, and materials of reference objects in an on-line fashion, utilizing the 3D, Doppler Imaging LADAR and the LADAR Vision Processor. The technology development program was designed to demonstrate the feasi-

bility of our innovation in support of systems requirements within the Satellite Servicer System Flight Demonstration program.

The LADAR Vision processing approach provides six-degree-of-freedom (6DOF) measurement (3 position, 3 orientation) of a single object with respect to the LADAR platform addressing the spaceborne rendezvous and docking application, and/or 6DOF data on both end-effector and target for robotic manipulator adaptive grasping based on image processing of the multi-dimensional Imagery. The basis of object orientation measurements is a 3D image gradient to determine surface normal direction and multi-dimensional correlation to perform optimal match to reference target orientation. The 6DOF position of the correlation reference provides the guidance error signals when the correlation tracker loop is closed. The system also provides simple object recognition based on hierarchic multi-dimensional feature matching, addressing a limited domain environment similar to the SSSFD demonstration flights.

Hierarchical 3D and Doppler Imaging CO<sub>2</sub> LADAR with programmable Fovea and Peripheral Vision:

The project applied innovations to coherent infrared laser radar technology to address the specific mission application of NASA spaceborne and automation robotics. The innovations resulted in an imaging LADAR approach tailored to operate safely in a large area dynamic environment yet provide highly accurate data required to accomplish complex tasks. The Phase II program developed a multi-function Range, Velocity, and Intensity Imaging LADAR that incorporates an advanced scanning capability to provide hemispherical coverage in a Doppler motion detection and tracking mode as well as increasing fine resolution for 3D image based object recognition. The hardware represents a state-of-the-art coherent infrared radar.

## Bernier & Associates, Inc.

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Leo J.D. Bernier, President  
Denise M. Bernier, Treasurer/Clerk  
Hazen E. Bickford, Controller  
Dawn E. Gregory, Lead Software Engineer

The mission of Bernier & Associates, Inc. is to develop and market data collection and consensus building products and services. The goals of B&A are to become the recognized leader in this area, maintain a strong financial position, and create a rewarding environment for all company personnel.

INFORUM is a Groupware system that is used to collect, organize, manage, and prioritize information. The system is unique in that it permits information to be collected easily from any number of different individuals (or groups) who may be geographically dispersed. A major advantage of the system is

that system users can supply information at any time it is convenient for them to do so, either all at once or a little at a time. The system provides an attractive alternative to some of the more traditional data collection techniques such as personal interviews, group brainstorming techniques, and printed questionnaires.

Like questionnaires, INFORUM permits a structured approach to collecting information about any subject area. The system provides the advantage of permitting the type of information being collected to be easily modified after data collection begins.

Like interview techniques, INFORUM permits information to be collected on a personal basis in the comfort of an individual's office. Unlike interview techniques, it is not necessary to schedule time for the interview. On the contrary, participants are given considerable amount of latitude in scheduling time to participate in any data collection activity.

Like "brainstorming," INFORUM encourages differing views to be captured, identified and evaluated for any topic. Also like brainstorming, INFORUM induces new ideas from ideas that have already been presented. Unlike brainstorming techniques, the system can address multiple topics simultaneously.

Additional development needed:

- A working version of INFORUM (Version 2x) is currently available and is being used at several different sites. The "x" signifies that the version is considered to be a developmental version;
- A new version of INFORUM (Version 3x) is completed and is currently being tested;
- The first commercial release of INFORUM (INFORUM 1.0) will be either Version 2x or Version 3x;
- It is our intention to mass market INFORUM. The first commercial release is possible within 12 months; and
- Five new developmental versions are planned over the next three years.

B&A is seeking the following relationships:

- B&A needs capital to underwrite the initial marketing expense. B&A will prepare INFORUM (Version 1.0) and perform the marketing activities. B&A's partner would provide the necessary funding;
- B&A is seeking additional resources needed to accelerate the development of INFORUM. B&A would develop the software system. B&A's partner would provide the funding; and
- B&A is seeking partners to establish a consulting business around INFORUM.

Qualified partners would enter into a cooperative arrangement with B&A to a) assist clients to use INFORUM, b) train clients in the use of INFORUM, c) develop and maintain knowledge bases, and d) use INFORUM on Wide Area Networks.

## BioQuant, Inc.

1919 Green Road  
Ann Arbor, MI 48105  
Tel (313) 995-2176  
Fax (313) 995-0550

Mr. Robert L. Montgomery, President  
Dr. Willfried Schramm, Vice President, R&D  
Mr. Thomas Porter, Chairman of the Board

BioQuant, Inc. is a biotechnology company formed to develop methods, procedures, and products for the non-invasive collection of body fluids for diagnostic evaluation of physiological markers. The company also develops analytical systems that can be used with non-invasively obtained specimens under non-laboratory conditions for screening procedures and diagnostic tests. The company manufactures a device for the collection of an ultrafiltrate of saliva, the SalivaSac<sup>TM</sup>.

## Brimrose Corporation of America

5020 Campbell Boulevard, Suite E  
Baltimore, MD 21236  
Tel (410) 931-7200  
Fax (410) 931-7206

Dr. S.B. Trivedi  
Dr. Sean Wang

Following are a series of products which have been developed as a result of the SBIR spin-off.

- Multi-channel gigahertz acousto-optic modulators for optical computing and interconnection.
- Single element acousto-optic 2-D scanners.
- Higher power acousto-optic cavity dump for Coherent Laser.
- Multi-channel germanium deflector for manufacturing technology.
- Laser AOTF for printed circuitry board manufacturer.
- Acousto-optic tunable filters (AOTFs).
- Luminar 2000<sup>TM</sup> NIR spectrometer based on AOTF for process control and analysis.
- LaserTrax<sup>TM</sup> II full color laser graphic display.
- Miniature AOTF module for optical fiber communication.
- Imaging AOTF for Raman, Fluorescence and IR spectral imaging.
- New detector materials: HgMgTe, HgCdTe.

- New photorefractive material CdTe-V, ZnTe-V.
- Material improvement, 'in situ' quality control for crystal growth of IR material.

Brimrose Corporation of America will utilize a Phase III research project to commercialize coherent light amplifiers, optical power limiters and phase conjugate optical devices for optical data processing at visible and near infrared wavelengths using low power CW lasers and laser diodes.

We are proud to mention that Brimrose was selected from a group of 6,000 companies to testify on behalf of the Small Business Innovation Research Program at a hearing of the committee on Science, Space, and Technology; U.S. House of Representative, due to our strong track record of commercialization of Phase II SBIR programs.

## CEMCOM Research Associates, Inc.

1919 Halethorpe Farms Rd.  
Baltimore, MD 21227  
Tel (410) 247-0012  
Fax (410) 247-0015

Dr. W.E. Hanford, Corporate Secretary

CEMCOM's goal is to be the best research company in the field of chemically bonded ceramics, profiting from licensing its technology.

CEMCOM Research Associates, Inc., while a very small business, is the world leader in the development of Chemically Bonded Ceramics. This class of products, which includes cement, has been taken from a mundane commercial material to a group of high-tech products, predominantly through SBIR funded research. Present research programs include:

- Cast net shape tooling for molding. This tooling can have either metal surface finishes or made with chemically bonded ceramic finishes and can be made in a variety of sizes, but it is particularly suited for larger tools.
- Blast and shock attenuation materials. These non-flammable, castable materials absorb and reflect the energy of high explosives. They were developed for packing explosives and bunker walls. They have found application in safes and security locations.
- Armor. This class of material is made hard enough and strong enough to compete with steel and ceramic armor. It has many unique capabilities, including high, multi-hit capability.
- An environmental process for combining the most undesirable coal ash and white water from the metals industry into a energy and chemical additive for cement clinker manufacture.

CEMCOM is seeking manufacturing and marketing partners who would be capable of suggesting different markets for its Chemically Bonded Ceramic materials. While CEMCOM would enjoy technical assistance, its staff is fully competent in this area.

CEMCOM is seeking a relationship with companies who can be the sales and manufacturing body of the company. CEMCOM would be the research and technical sales arms. An agreement in which CEMCOM would receive a royalty for products sold and costs for its technical assistance is envisioned.

## CF Technologies, Inc.

One Westinghouse Plaza, Suite 200  
Hyde Park  
Boston, MA 02136-2059  
Tel (617) 364-2500  
Fax (617) 364-2550

John Moses, President  
Zlatxo Altiparmakov, Engineer  
Bill McGovern, Engineer  
Stephanie Rouanet, Engineer  
Robert Colp, Engineer

CF TECH develops and commercializes processes and products based on the use of critical fluid technology.

CF TECH is currently working on two DARPA sponsored SBIR Phase II projects based on supercritical fluid processing. One project has focused on the development and testing of a process for the extraction and reactive destruction of hazardous materials in a totally enclosed, near-ambient temperature process. In the second project, multicomponent aerogels are being developed for various military and advanced materials needs.

The reactions project application under development is the extraction and catalytic decomposition of hazardous materials of interest to DoD. Supercritical carbon dioxide is used as both the extractant and the reaction carrier solvent.

Aerogels are extremely light weight, high surface area, porous solids typically composed of silica. They are best known for their outstanding thermal insulating properties. CF TECH has improved processes for the manufacture of aerogels and developed multicomponent formulations for increased strength and tailored chemical properties.

The Phase II programs consist of pilot scale testing of the processes, application testing and demonstration, and process modeling and optimization. These programs also include the conceptual process design for a full scale prototype.

At the completion of Phase II of each project, one application of the technology should be well developed and ready for commercialization. Other applications of the technology will require additional test and development work.

CF TECH is seeking partners for the development of products and processes for other applications of the reactions and aerogel technology.

Reactions: The process should lend itself to treating and destroying a variety of hazardous materials including mixed wastes, demilitarization program ma-

terials, and cleanup involving contamination with chlorinated organic compounds.

**Aerogels:** Multicomponent aerogels have been made in which the chemical and physical properties have been tailored to match the specific needs for a product. We are identifying other uses for aerogels and seek partners interested in the development, testing, and commercialization of aerogel products.

## CHI Systems, Inc.

Gwynedd Plaza III, Bethlehem Pike  
Spring House, PA 19477  
Tel (215) 542-1400  
Fax (215) 542-1412

Wayne W. Zachary, President and Chief Executive Officer  
Floyd A. Glenn III, Vice President & Chief Operations  
James H. Hicinbothom, Senior Scientist (Project Manager)

**Company Purpose and Goals:** Providers of tools and services to developers and users of advanced interactive software systems.

The software engineering community is in need of tools that can provide useful, affordable usability testing and evaluation of design concepts throughout the software system life-cycle. Rapid interface prototyping tools help develop (and sell) software products to potential users, but they are unable to perform the needed usability testing. The Intelligent Interface Construction (IICON) Evaluator solves this problem for advanced software systems that are built using industry-standard X Window Graphics User Interface (GUI). IICON Evaluator provides a unique set of features:

- Automated data collection, via a session record and replay facility supporting text and voice annotations;
- An expandable toolset for analysis of human-computer dialogues;
- Means of 'scripting' the behavior of incomplete modules or sub-systems allowing full evaluation of user-system interaction well before software engineering is completed; and
- An integrated repository for all evaluation data and annotations from distributed sites for each HCI evaluation.

IICON Evaluator allows more effective development of advanced interactive software, reduces down-stream 'fixes' and maintenance costs, and enhances reliability of, and end-user (customer) satisfaction with, the final software product.

**Additional Development Needed:** Refinement of interface and "bullet-proofing" code to meet or exceed current commercial ("shrink-wrap") standards. Modular extension to support a wider variety of Graphical User Interface (GUI) builders.

**Implementation Strategy:** (1) Raise capital, develop shrink-wrap product, distribute and sell, and (2) Strategic Alliance with software developer or (CASE) tool company, integrate as custom tool and license Strategic Partner.

## CoGenTex Inc.

840 Hanshaw Road, Suite 5  
Ithaca, NY 14850-1589  
Tel (607) 266-0363  
Fax (607) 266-0364

Richard Kittredge, Ph.D., President  
Tatiana Korelsky, Ph.D., Vice President for Applications  
Ehud Reiter, Ph.D., Senior Computational Linguist  
Owen Rambow, Ph.D., (candidate), Computational Linguist  
Daryl McCullough, M.S., Computer Scientist

CoGenTex brings recent advances in knowledge engineering and natural language technology to commercial fruition in more intelligent user interfaces. Applications emphasize textual output from databases often coordinated with graphics, in domains as diverse as weather forecasting, statistical summaries, project management reporting and automatic software documentation.

CoGenTex is applying its text planning and linguistic generator software to build a full-scale portable Intelligent Project Reporter (IPR) for software engineering environments. The current goal is to provide project management reports for Rome Laboratory's Software Life Cycle Support Environment (ProSLCSE). ProSLCSE is an advanced software engineering environment which supports the development and life cycle of software according to DoD standards. The IPR uses a combination of domain and linguistic knowledge to interpret facts in the ProSLCSE database for reporting purposes. The IPR will be integrated with ProSLCSE to cover a broad range of reporting topics including project events governed by the 2167A standard, and by the MIL-STD-1521 review activities standard. Special attention is given to reporting of problem situations, as well as to configuring reports to various user needs through a convenient interface. Users are given options for adding explanations of summary statements, for automatic inclusion of tables and graphs which complement the text, and for integrating the output with document formatting capabilities of ProSLCSE. Intelligent textual reporting from software project databases will not only save management time, but also encourage more complete and uniform reporting standards. Commercial applications include providing a textual reporting capability for industrial CASE tools as well as for general-purpose project management software.

Application to industrial CASE tools or to general-purpose project management software will require tailoring of knowledge bases and interface. For projects not following well-known and formalized management standards, more knowledge acquisition capability will need to be added to the interface.

Natural partners will include developers and vendors of industrial CASE tools, particularly those involved in the DoD-sponsored Knowledge-Based Software Engineering (KBSE) effort. The IRG will add value to commercial CASE/KBSE products. Companies or government agencies with very large



or multiple software projects may derive extra value from specially tailored additional reporting features provided by CoGenTex.

## Coherent Research, Inc.

1 Adler Drive  
East Syracuse, NY 13057  
Tel (315) 433-1010  
Fax (315) 433-0070

Charles D. Stormon, CEO & Chief Scientist

Most utility companies recognize that implementing an Automated Mapping/Facilities Management (AM/FM) system of Geographic Information System (GIS) is critical to their long-term competitiveness. AM/FM/GIS systems can significantly enhance utility responsiveness while reducing operating costs.

The primary obstacle to implementing AM/FM/GIS has been the high cost of establishing a facilities database by converting thousands of hand-drafted maps. By eliminating up to 90% of the labor involved in map conversion, SmartMaps™ automated map conversion system enables utilities to implement an AM/FM/GIS system in a cost-justified manner.

SmartMaps™ allows you to have both quality and reduced cost. SmartMaps' knowledge bases are customized for your maps, your drafting standards, and your database formats. When part of a map is too difficult to read, SmartMaps asks you for help, integrating conversion AQ/QC operations. You get maps converted for a total cost roughly equal to the QA/QC portion of a traditional conversion budget.

We developed SmartMaps by integrating several advance technologies. The result is a turnkey conversion system customized for the specific symbols, attributes, and relationships between objects that are found on each type of map. SmartMaps exports the results of your conversion into a customer-selected database or AM/FM/GIS format. SmartMaps accepts input from a scanner or other raster image source. There is no customer programming required; the system arrives ready to use.

The benefits of an enterprise-wide AM/FM/GIS system can be grouped into four primary areas: Employee productivity and safety; Reliability; Competitiveness; Regulatory compliance.

We are interested in partnering with software, hardware and system integrators in the imaging and document management, CAD, and AM/FM markets.

## Columbia Cascade, Inc.

12020 Sunrise Valley Drive, Suite 200  
Reston, VA 22091  
Tel (703) 860-0866  
Fax (703) 860-8449

Marcia A. Smith, President  
Robert D. Smith, Vice President

Columbia Cascade is a professional services company specializing in advanced application software design and development. The company's focus is in the use and integration of artificial intelligence tools (expert systems, neural networks, data discovery and analysis) and advanced database design to provide effective and practical decision support solutions for business and government clients.

Expert System for Medical Review:

Health Care Intermediaries are required by the Health Care Financing Administration (HCFA) to carry out a focused Medical Review (FMR) program to determine: The medical necessity for Medicare coverage; the appropriateness of services provided; the level of care provided; if frequency and duration of services are appropriate; and ensure only covered services, equipment and supplies are billed to the Medicare programs.

The Medical Review expertise and knowledge of Medicare claim coverage criteria needed for an effective FMR program are not easily obtained. It often takes four to six months of training to become proficient in just one or two of the many claim review areas. Even more experienced analysts are finding it difficult to keep pace with the growing complexities of Medicare claims.

The completed system will provide expertise to a larger, less expert group of users thereby reducing the unit cost of Medical Review. It will assist in standardizing the claim review process and provide standard documentation of reviews conducted. It will assist Intermediaries in preserving human expertise contained within their organizations, expedite the review process, reduce training time, and allow personnel to perform reviews in areas in which they are not specialized.

Phase II will further develop an expert system prototype that will perform the above described tasks at a professional review level such as is now performed by registered nurses and/or other professional personnel. Specifically, Phase II will interface the prototype to existing claims processing systems utilized by most intermediaries, increase the medical review topics (Claim areas) to be examined by the system, and complete the development of topics commenced during Phase I. Some additional development may be required in Phase III.

The primary market for the product are Intermediaries currently conducting Medical Reviews of Hospital Outpatient Claims such as the various Blue Cross and Blue Shield Plans, Aetna, Mutual of Omaha, etc. The concept could be expanded to inpatient claims, Skilled Nursing Facility (SNF) Claims, and other programs such as Medicaid.

Potential joint venture partners, partnerships and/or strategic alliances would include:

- Intermediaries currently involved in Medical Review Activities;
- Professional Review Organizations (PROs) which currently perform inpatient medical review expertise;
- Companies involved in Health Care Systems; and
- Companies desiring entry into the health care systems environment.

Columbia Cascade is primarily interested in companies who can provide marketing and distribution of the finalized product and/or medical expertise to expand and enhance the existing development effort. We are open to the form and structure of participation by interested companies.

## Command Control, Inc.

8800 Roswell Road, Suite 130  
Atlanta, GA 30350  
Tel (404) 992-8430  
Fax (404) 993-3603

H. Bennett Teates, President  
Stephen K. Fitzpatrick, Engineer

CCI is a professional services firm which applies innovative ideas and technology to the analysis, design, development, implementation, and support of systems to solve operational problems. CCI provides systems integration services with an emphasis in communications. Engineering development at CCI follows a rapid prototyping philosophy designed to quickly bring new technology to applications.

CCI is currently developing the Multimedia Information Communications System (MMICS) for the U.S. Army, CECOM. Items being developed include the Communications Subsystem, an interface to the Army's MSE network, and a videoconferencing application. The Communications Subsystem provides a dynamic bandwidth allocation scheme to multiplex the different media into an integrated data stream for transmission. This process is performed through asynchronous cell-relay, similar to Asynchronous Transfer Mode (ATM) communications.

The MMICS interface to the circuit-switched portion of MSE runs at a variety of data rates. A rate of 112 kbps is supported through an inverse multiplexer, which combines the bandwidth of several digital voice lines. A low bit rate (16 kbps) interface is provided through the DNVF device.

MMICS videoconferencing is a distributed application which provides the real-time communication of audio, video, text, graphics, and still imagery. Still and real-time motion video is shown in a windowed display on the screen. A screen menu provides control functions for the conference. This application may serve as the core of other domain-specific tactical applications, decision-aids, etc.

The MMICS terminal consists of a UNIX-based 486 personal computer and its peripheral devices, including a camera, a handset/headset phone, and audio/video compression hardware. Examples of system usage include intelligence analysis, weather forecasting, medical diagnosis, briefing, operations planning, and battlefield situation display.

Phase II MMICS development will result in a prototype system which demonstrates the basic capability to transmit multimedia data using the CCI dynamic bandwidth allocation scheme. Additional work needed is the development of specific applications which incorporate videoconferencing or other

collaborative work. More importantly, the fielding of MMICS multimedia capabilities in the military or in a commercial environment requires that the system be repackaged in an appropriate form for manufacturing and customer usage. A brief description of the envisioned system is described in the following section.

The repackaging of MMICS for military/commercial usage involves separating most of the multimedia functionality from the host computer. CCI is planning a small, stand-alone MMICS unit, containing the audio/video compression hardware, MMICS network protocols, MSE network interface, and possible additional communications interfaces (satellite, T-1, ATM). Audio and video plug directly into this unit. The unit also provides audio and video outputs. A standard, serial data interface conveys text, graphics, and system control data between the MMICS unit and the host system.

The host system consists of a computer (PC, laptop, workstation, etc.), operating system (DOS, Windows, UNIX, etc.), standard serial interface (RS-232), camera, monitor, and display hardware for the monitor. This arrangement removes operating system dependencies and multimedia hardware complexity from the host system. In this manner, MMICS videoconferencing capabilities may be added to a variety of existing systems.

CCI is seeking a Phase III strategic partner, or partners, to support the commercialization of MMICS. Appropriate sponsors may include hardware vendors, commercial/military applications developers, and commercial/military customers with multimedia communications requirements. The following items are sought from Phase III partner(s): Funding for the additional system development, expertise in hardware packaging, manufacturing, and marketing. CCI will perform the systems integration, required software modifications, and testing.

## Compact Software

483 McLean Blvd.  
Paterson, NJ 07504  
Tel (201) 881-1200  
Fax (201) 881-8361

Dr. Reza Tayrani, Director, MIMIC/SBIR Programs  
Dr. Ross Hicks, Vice President Engineering  
Dr. Ulrich Rohde, President

Compact Software is the pioneer of CAD tools for the simulations of RF, microwave and light-wave circuits and components. Our goal is to provide our customers with the most accurate, efficient and cost effective simulation tools.

Compact Software has embarked on two major advanced device modeling programs. The overall objectives of the two complementary programs are to enhance the accuracy of active models both for the computer-aided design of MMIC's as well as for the prediction of device characteristics from the process recipe (physics-based modeling).

The first program entitled "Process and Physics-Based Device Models for MESFET, pHEMT and HBT" is supported by DARPA under Phase II SBIR program.

The objective of the Phase II SBIR program is to provide upgrades to our linear and non-linear simulators (Super-Compact and Microwave Harmonica respectively) to accommodate the incorporation of fast, first-order, physics-based MESFET, HEMT and HBT models developed during the course of this program. The device modeling efforts will specifically address advanced devices such as MBE grown 0.25-0.1 micron gate pHEMT, HEMT, MESFET as well as HBTs (NPN, PNP). These device models will complement our existing simulator models and will provide a means of fast circuit analysis and optimization.

The new models will possess the following enhanced capabilities:

- Bias and temperature dependent device performance predictions based explicitly on the device physical parameters.
- Prediction of device equivalent circuit element statistics based on the process variations.
- Physics-based model descriptions will also be provided as well as an enhanced means of accessing foundry database information. These latter features will enable the support of statistically based model descriptions as well as circuit simulations.

The second program entitled "Accurate Device Models For Computer Aided Design of MMICs" is supported by the US Department of Defense under MMIC Phase 3 program.

As the result of these on going programs, commercial, easy-to-use, well-supported software modeling tools will be made available throughout the industry for computer-aided design of MMIC circuits as well as for MMIC processing and manufacturing.

Further SBIR funding in the range of \$300K will enable us to start the full release of our product, the version of which is currently under development.

Considering the low level of investment that is needed for the full commercialization of our product (\$300K), it is our belief that the best strategy would be to request further funding support through the SBIR or related offices. We would like to have the opportunity to discuss this issue further.

## Complere Inc.

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Palo Alto, CA 94302  
Tel (415) 321-5630  
Fax (415) 321-3929

Dr. F.K. Owen, President and Director of Research & Development  
T.K. McDevitt, Project Manager  
T.A. Ambur, Senior Research Engineer

Complere Inc. provides custom instrumentation and consultant research services in fluid mechanics and energy systems. Our Phase III aim is to improve and extend these services.

Complere Inc. is a small business incorporated in the state of California in February, 1979. The company currently conducts SBIR and other contract research in the areas of fluid mechanics and energy systems. These programs involve the design, development and application of advanced optical diagnostics to wide ranges of fluid flows. Current research capabilities include two and three dimensional laser velocimetry, holographic interferometry and original interface designs and software developed for data acquisition and analysis. Programs also involve advanced hot wire turbulence and dynamic pressure measurement techniques. During the past fourteen years, Complere Inc. has established a proven record of financial sponsorship from the private sector and several Government Agencies. With SBIR support, Complere Inc. is currently developing instruments to improve low and high speed wind tunnel turbulence, flowfield and model attitude measurement accuracy, the design of aero-assisted space transfer vehicles and determine the characteristics of oceanographic turbulent mixing flow fields. With SBIR Phase III funding, these efforts will be applied to meet the significant National need to develop new technology which will improve our competitive edge. These needs are strategic, environmental and financial.

Access to Government and Private test facilities would greatly assist in our Phase III commercial instrumentation development.

Our Phase III SBIR commercial activities include in-house product development and commercialization and ongoing negotiations of strategic alliances with several local and national small and large businesses, two oceanographic institutes, the company bank and potential venture capitalists. We are confident that these efforts will provide us with the necessary investment capital, specialized equipment and test capabilities for the future commercial development of our instruments and products. This will in turn contribute to small business job creation and long term economic growth.

## Computational Mechanics Corporation

601 Concord St., Suite 116  
Knoxville, TN 37919  
Tel (615) 546-3664  
Fax (615) 546-7463

Paul D. Manhardt, Chief Executive Officer  
Allen J. Baker, President  
Joseph A. Orzechowski, Vice President

Company Purpose and Goals: R&D of world class CFD Science and Technology Products. Application of CFD for computational modeling of Grand Challenge Problems of importance to government and industry.

This Phase II SBIR project for Benet Laboratories at the Watervliet Arsenal, addresses the important problem of gun crew safety as reload speeds in-

crease. Flareback and smoke emissions which can randomly occur during multiple firings are dangerous and mentally debilitating to the gun crew. Proper design of gun bore evacuator mechanisms can prevent the circumstances of flareback from occurring. Through direct comparison with carefully monitored experiments, this project demonstrates that flows associated with gunbore evacuators can be accurately modeled using Finite Element CFD. The Phase II capability will provide a user-friendly CFD design program called AKCES.BOREVAC. The delivered system will be capable of real gas flows modeling including 3D Navier-Stokes flow, effective turbulence modeling and wall dissipative effects, for a wide variety of bore-evacuator designs. The design interface will have modern window/pull-down menu interfaces and fast graphics so data can be quickly entered, modified and graphically verified prior to execution of a model. Similarly, model results will be viewed graphically and dynamically to ensure accurate interpretation of results. Implementation in an efficient parallel processing framework provides the computational speed for an effective design tool.

### Computer & Concepts Associates (C&C)

P.O. Box 24246  
San Jose, CA 95154  
Tel (408) 723-5103  
Fax (408) 723-5103

Michael W. Evans, President  
Lorna A. Fox, Director of Administration

C&C Associates provides clients products and services to assist in the improvement of software management, engineering, assurance and reporting processes and procedures.

C&C Associates is developing software oriented handbooks, training videos, data bases and software assessment procedures and questionnaires. The intent of these is to provide an accessible means for software management, engineering and assurance personnel to get "how to" instruction supporting software project requirements. C&C Associates is also establishing a Software Program Managers Network to allow DoD, government and academic personnel to share "Lessons Learned" and project experience.

Additional Development Needed: Productionize the Lessons Learned Database and provide updates on a subscription basis.

### Computer Science and Applications, Inc. (CSA)

2 Clifford Drive  
Shalimar, FL 32579  
Tel (904) 651-4991 ext. 122  
Fax (904) 651-2816

Marion S. Skalka, President  
Clifford H. Allen, Jr., Director, Tactical Simulation Group  
Robert S. Roberson, Field Manager  
Ronald E. Goodfellow, Director, Technology Development Group  
M. Chatt Johnson, Deputy Field Manager

CSA is a high technology company specializing in system studies, model simulation development, real-time simulation and test facility support, and computer and electronic maintenance support. CSA's goal is to be best in efforts we support in the above areas, maintain our excellent reputation as a high technology company and maintain our annual growth rate.

The requirement to investigate the radiation patterns of antenna in a complex environment, such as installations on airborne vehicles, generated the need for an accurate engineering solution to practical antenna problems. The free-space radiation patterns of antenna elements are highly distorted by reflections and diffractions on complex structures. Cut-and-try antenna element design and placement on such structures followed by testing are time consuming and costly.

CSA, through the SBIR Phase I and Phase II Program, developed the PC desktop "Airborne Antenna Pattern Prediction Program (A<sup>2</sup>P<sup>3</sup>)" computer simulation analysis tool. This user friendly simulation program provides the ability to predict radiation patterns from single and multiple antenna locations on complex airborne vehicle structures to support the design and development of systems such as scoring systems, radar warning receivers, missile attack warning systems, and telemetry and data link installations.

The RPPAT Program objective is to expand the A<sup>2</sup>P<sup>3</sup> technology to commercial applications such as design and application of antenna systems for communication and information systems associated with civil, police, and emergency ground and airborne vehicles; command and control of rescue helicopters, police cars, and ambulances; highway vehicle traffic control radar; and mobile telephones and civilian highway automatic traffic routing systems.

## Convolve, Inc.

1 Quarter Mile Road  
Armonk, NY 10504  
Tel (914) 273-4042  
Fax (914) 273-4051

Neil C. Singer, Ph.D., President  
B. Whitney Rappole, Jr., Principal Engineer  
William Singhose, Principal Engineer  
Warren P. Seering, Ph.D., Vice President

Convolve, Inc. is working on continuing the development of the patented Input Shaping<sup>TM</sup> method of reducing structural vibrations in controlled systems and incorporating Input Shaping<sup>TM</sup> into commercially available products.



Input Shaping™ is a new method of moving controlled systems without exciting the resonant modes of the system. The basic Input Shaping™ algorithms are patented by MIT. The stated goals of our SBIR Phase II are to continue the development of the Input Shaping™ algorithms to enable successful implementation of the technology on commercial systems. Input Shaping™ is a software method that will improve the dynamic performance of computer controlled systems. The method involves the convolution of the reference command with an impulse sequence, producing shaped commands which will not excite resonances in the system. At the SBIR conference, we will be presenting an interactive demonstration system where visitors will be able to discover first-hand the benefits of Input Shaping™ vibration reduction technology.

All that remains under development is the tailoring of the algorithms for specific computer systems and design of an improved user interface to simplify the installation of the algorithms.

Convolv has several goals for increasing the use and availability of Input Shaping™ technology in commercial applications. First, we are working with individual companies to incorporate Input Shaping™ into existing equipment: Coordinate Measuring Machines, Silicon Wafer Handling Systems, NASA Robotic Structures, for example. Second, we are looking to establish joint ventures with companies who make motion controller products. Specifically, we would like to see Input Shaping™ technology included as a standard feature on commercially available motion control boards. We are currently working to concurrently raise the interest level of both companies with systems which will benefit from Input Shaping™ technology and the companies who supply the controller boards which are incorporated in the systems.

### Corticon, Inc.

3624 Market Street, Suite 508  
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Fax (215) 387-6959

Dr. Paul Mueller, Chairman & CEO  
Dr. Jan Van Der Spiegel, Vice President, Engineering  
Dr. David Blackman, Vice President, Product Development  
John Howell, Vice President, Marketing

Corticon designs and develops analog VLSI systems and software for real-time neural network applications.

Corticon is involved in the hardware implementation of neural networks. The company has built a patented general purpose analog neural computer. A prototype has been completed, the first full scale machine to be delivered September 1993. The machine is modeled after the brain and is composed of electronic analogs of neurons, synapses and programmable interconnects. It can be expanded to any size without performance degradation. The cur-

rent version contains over 800 directly interconnected VLSI chips and is capable of more than  $10^{12}$  equivalent FLOPS.

The computer runs entirely in analog mode. However, connection architectures, synaptic gains, time constants and neuron parameters are set by a digital host computer which also monitors the network performance and implements learning algorithms. The VLSI technology was developed jointly with the University of Pennsylvania. Primary areas of application include real-world, real-time or compressed-time pattern analysis and recognition; e.g., speech recognition, vision, robotics, the design of dedicated neural circuits and the implementation of different learning algorithms. The machine is also used to develop application-specific neural circuits (ASICs). Neural circuits developed on the machine can be directly transformed into ASICs from their neural components stores in VLSI libraries. Using the prototype as an emulation tool Corticon has developed analog neural circuits for real-time acoustical pattern decomposition applied to speech recognition and a chip for 2D real-time tracking of moving objects. Corticon projects that analog neural networks and ASICs will play an increasing role as preprocessors, signal conditioners and classifiers in special purpose digital systems. The inherent fault tolerance, unprecedented speed, low cost and small size of neural analog preprocessing stages make them the ideal technology for future hybrid analog/digital systems.

The hardware and operating software of the neural computer are essentially complete. Future development shall focus on software for selected applications and the production of neural ASICs with applications in acoustics, vision and robotics.

Corticon is interested in alliances with companies that plan to establish a presence in the emerging market of neural computation. This would include companies with interest in specific applications such as speech recognition, vision or robotics.

A partnership could take the form of shared resources, product marketing and the joint development of products for specific applications. Corticon can contribute its proprietary technology and its expertise in VLSI design, systems development, neural network theory and application.

## Creative Optics, Inc.

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Dr. John F. Ebersole, President & Principal Scientist

The mission of Creative Optics, Inc. is to engage in research and development in order to provide solutions to specified problems in the evaluation, analysis and testing of systems and concepts related to (1) electro-optical, infrared, and millimeter wave sensing, (2) automatic target recognition, (3) camouflage and deception, (4) human perception in man-machine systems, and (5) multisensor data fusion.

Creative Optics, Inc. has developed a Mobile Army Camouflage Evaluation (MACE) system in a Phase II for the US Army Natick RD&E Center. Object search and detection by the human observer has been determined, by perceptual psychologists, to depend heavily on texture segregation and perceptual grouping of simple characteristics that include color, brightness, orientation, closure, and line terminations. The MACE system, therefore, makes use of standard texture statistics, based on the spatial grey-level co-occurrence matrix, as a set of objective measures for similarity of a camouflage to the local background.

One of the innovations of the MACE project is the extension of the evaluation of monochrome images to explicitly cover color imagery in terms of CIE standard coordinates. The MACE system hardware and software can capture, digitize, preprocess and record a set of 10 monochrome images that uniformly sample the visible spectrum. Transformations have been implemented that reduce the set of monochrome images to the CIELAB coordinate system for subsequent texture analysis. Our approach has resulted in minimizing computational load without sacrificing critical texture information. The MACE system also creates a scale space representation of the color-component images—this allows the user to isolate size-dependent characteristics of camouflage.

In addition to meeting Army needs for camouflage evaluation, the MACE system may find military applications in IFF/combat ID, automatic target recognition, simulation fidelity, camouflage design, reconnaissance, and target signature analysis. Commercial applications may include smart highways, smart medical imaging, improving automated non-destructive testing, surveillance, and improved training and safety.

Natick RD&E Center is already funding a Phase III effort to extend the MACE system to night vision device technology (image intensifier and thermal IR), thereby making MACE a multispectral camouflage evaluation system. We believe that a high-fidelity model of the human visual system can be developed using our MACE technology. Achieving this important first step in commercializing this technology will result in more robust algorithms which can be kept proprietary to insure profitability of the sponsor as applications are developed. Succinctly then, wherever human visual perception is a key factor, our proposed improvements in understanding and modeling the human vision system will provide greater benefit—and thus wider applicability.

As a successful (11-year old) DoD R&D company, we have concentrated on servicing the requirements of our DoD customers. This has included conversion of several Phase I SBIR contracts to Phase II and Phase III. At the present time we are open to teaming relationships that, for example, may involve (a) small business set-aside contracts, (b) sole source Phase III Government programs, and (c) direct large-company support for commercial enterprises. Thus Creative Optics, Inc., could serve alternately as prime contractor or as subcontractor, depending on what best fits the nature of the alliance.

## C.T.K. Enterprises

6575 E. Paseo Diego  
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Mr. Charles T. Kleiner, President, Principal Investigator  
Dr. Jean E. Campbell, Controller

Company Purpose and Goals: To find companies/agencies that would like to help us exploit the following: 1) "Radiation Hardened Magnetic Voltage and/or Current Reference" Pat. #4,977,374, and 2) "Magnetically Controlled Variable Transformer" Pat. #4,907,246. No. 1 was developed by CTKE for the USAF under Contract: F04704-90-C-0008 (PH II).

This R&D project resulted in the development and test verification of a highly accurate, predictable, stable and radiation hard voltage reference.

The Hard Magnetic Reference (HMR) is based on a) a highly stable Samarium Cobalt (Sm Cos) permanent magnet that is used as the basic reference, b) a magnetic second-harmonic null detector that produces an AC error signal. (The signal is generated by cancellation of the magnetic flux field from the magnetic flux field from the magnet using a fed-back current), and c) an electronic control loop composed of hardened electronics.

The technology developed under this SBIR Phase II contract is applicable to a wide range of electronics such as those used in advance guidance systems, nuclear instrumentation and commercial applications where long term, unattended service is required. The magnetic technology can also be applied to the design of hardened power subsystems.

The technology must be directed toward non-defense business using commercial high-rel semiconductors to provide a lower-cost version of the product. There is still a need to target particular business areas that could use the technology and then build demo units for trial use in real applications.

What we would like to do with this technology is transfer the techniques to larger companies whereby we provide consulting and prototypes and the larger organization would manufacture the end product. Because our technology is patented, we can offer more protection from foreign competition as the products are developed.

## Cybernet Systems Corporation

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Heidi N. Jacobus, President  
Mark Taylor, Engineer

Cybernet Systems Corporation integrates specialty people-centered hardware and software systems for industry, military and space uses. The company develops specialized products through evolutionary application of advanced technology in Robotics and Automation, Human-Computer Interfaces and Computer-Aided Training.

Cybernet Systems' PER-Force Handcontroller is a small backdrivable robot handle which moves in 6 degrees of freedom (positions x,y,z) and 3 attitudes (roll, pitch, yaw). The operator uses the motorized handle to precisely position robots or graphically displayed objects.

In most remote or analytical systems, operator feedback is limited to mouse or stick displacement in two dimensions or visual feedback from CRT screens. With six axis force reflection and six axis orientation and position control, manipulation and "feeling" of multi-dimensional objects or datasets can be done with ease.

The handcontroller generates "force-feedback" using six small, brushless DC servo motors. For example, if a robot system is equipped with force sensing devices, the output of the sensors can be used to apply contact forces to the handle. Therefore, the operator can "feel" contacts "remotely." Force feedback can alternatively be generated from controlled slave robot inertial estimation (producing forces derived by how quickly the slave robot can move as commanded by the operator).

Many applications exist for teleoperation in hazardous environment (e.g., nuclear, undersea, environmental clean-up), and virtual reality environments such as molecular modeling or simulations, and in advanced manufacturing techniques.

### Davis Technologies International, Inc. (DTI)

5025 Arapaho Road, Suite 505  
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Fax (214) 387-4916

Richard L. Davis, President  
A.R. Davis, Vice President  
Leo W. Davis, Director of Engineering

After eight successful years of designing, manufacturing, and selling compressible fluidspring suspensions to the mining and construction industry world wide, the principals of Davis Technologies International, Inc. founded DTI in 1988 for the purpose of developing and commercializing advanced suspension and shock attenuation systems which have dual use production sales and/or licensing potential for automotive and aircraft applications in both the military and commercial markets.

In a Phase II SBIR project for N.S.W.C. regarding development of a compact, lightweight, high mobility suspension for the U.S.M.C. LAV-25, DTI has designed and built an innovative compressible fluid suspension system which integrates spring and damping function into one compact cylinder unit replacing

the larger, heavier suspension components currently used at each wheel. Typically no larger than a common shock absorber, the DTI design completely eliminates the additional space and weight requirements of bulky steel coil, leaf springs, torsion bars, gas/oil struts or air bag systems. The system's compactness and configuration flexibility provide almost unlimited retrofit and future vehicle application possibilities. The DTI system's unique spring curve characteristics provide stable and firm vehicle control without the ride stiffness and vibration transmission associated with current systems and the system's instantaneous shock response and advantageous damping rates provide unmatched vehicle ride quality. The DTI system is the prime element in future suspension development ranging from simplified passive to electronic fully active systems for automotive, truck, aircraft and rail transportation. The systems potential for dual use applications are bringing its unique package, performance characteristics and cost reduction benefits to the forefront of suspension technology with a wide range of commercial and military applications.

DTI has already developed and patented its technology for use in the commercial and military automotive market. DTI would like to vigorously pursue new applications of the technology and potential patents in the areas of aviation and vibration isolation.

DTI would like to locate and evaluate potential manufacturers/sales firms or investment groups which are already involved in or have an interest in our areas of technical expertise. DTI recognizes that several different partners may be required for full exploitation of this technology because of the selected application breadth. Ideally, that entity would be a company that could provide the financial means to fund development of potential/selected applications of the technology, then manufacture these applications under a licensing/royalty arrangement with DTI.

DTI would provide the transfer of the technology or continuous application engineer development support if required. The company would provide the funding for these engineering effort means to manufacture and market the technology product.

DTI's preference would be to start an alliance with an entity in the automotive commercial/military market initially, then move on to aviation and vibration isolation markets.

## Dedicated Electronics, Inc.

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Dennis P. Glynn, III, President  
John C. Joseph, Vice President  
Philip J. Joseph, Vice President  
Thomas O. Perkins, III, Vice President

Dedicated Electronics, Inc. is a privately-held company that was formed to solve microwave engineering problems. Business includes communication systems and custom microwave assemblies for radar, instrumentation, and communications.

An instrument that non-obtrusively measures the thickness of fresh-water ice is being developed. Operation is based on relating the measured reflections of microwave signals at multiple frequencies to ice thickness. The one-person portable instrument is placed on the ice surface, performs an automated measurement sequence, and displays thickness in a numeric display.

The ice-measurement instrument is a complete, portable, microwave reflectometer. It is equivalent to a one-port, vector network analyzer. The instrument includes a synthesized transmitter, integral antenna, phase-locked receiver, and vector demodulator. An internal microprocessor controls the measurement process and performs the calculations to determine ice thickness.

The instrument will provide an improved means of measuring ice thickness. It is small, inexpensive, and performs measurements quickly. Other techniques require drilling through the ice or using highly complex and expensive instrumentation.

The instrument can be adapted for other applications. It can measure the magnitude and phase versus frequency of dielectric materials. This information can be manipulated to yield material thickness, reflectivity, or dielectric constant. Possible applications include determination of moisture content of wood during kiln drying, quality control of antenna radome materials and radar absorbing materials, measurement of coating thicknesses in industrial processes, and measurement of thickness of snow for ski resorts.

Development of the ice-measurement instrument will be completed during this Phase II project. Additional development will consist of modifying the system for other applications.

Implementation of the basic ice-measurement instrument will be completed independently by Dedicated Electronics, Inc. Dedicated Electronics is open to discussions regarding alliances for development of the instrument for other applications.

## DESE Research, Inc.

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Wallace E. Kirkpatrick, President/CEO  
Alfred E. Wyatt, Sr. Vice President  
Stephen J. Kirkpatrick, Vice President  
Dr. Robert M. Smith, Project Director

DESE Research, Inc. was founded in 1982 with the goal of providing high quality research and engineering services to governmental agencies and pri-

vate industry. The business areas of interest to the company encompass the fields of Defense, Energy, Space, and Environment. DESE is established as a small business under the Federal Regulations of Title 13, Section 121.3-8.

DESE Research, Inc. is performing a Phase II Small Business Innovation Research (SBIR) Program in the area of Image Enhancement processing for the U.S. Army Anti-Satellite (ASAT) Joint Program Office. The image processing algorithms were developed for modern visual sensor guided engagements of complex satellite targets. These algorithms produce target shapes. The shapes provide the complex data from which accurate target and aimpoint selection can be accomplished in a variety of environmental and background conditions, including star, earth limb, and albedo effects. This image processing capability is currently being assessed for a variety of medical applications. The Image Enhancement System (IES) technology is specifically being developed with a view toward improving diagnostic capabilities for radiologists and providing ophthalmologists with a tool for enhancing sight for the visually impaired. Potential medical applications currently under investigation include X-ray analysis and diagnosis of diseases of the eye.

### Dimension Technologies, Inc.

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Arnold D. Lagergren, President  
Jesse B. Eichenlaub, V.P. Technology  
Mark E. Katafiaz, Director, Tech. Oper.  
Todd C. Touris, Systems Eng. Manager

Founded in 1986 to develop, produce and market unique autostereoscopic displays, Dimension Technologies, Inc. has grown steadily, expanding its technology to include potential order of magnitude improvements in Liquid Crystal Display (LCD) brightness and resolution. DTI's strategy is to attract customers with substantial end-markets in targets such as medical endoscopy, situational avionic displays, telerobotics, and industrial inspection.

DTI's SBIR Phase II developments have advanced and are advancing its proprietary parallax illumination technology which allows autostereoscopic viewing of 3D imagery on flat panel displays. SBIR Phase II funding has been used to break through technical barriers which had previously caused lost resolution, viewing restrictions, and image distortions, thus limiting the utility of 3D display technologies in a variety of markets.

DTI's innovation consists of a unique combination of optics and illumination which, when combined with a transmissive image forming device, such as an LCD, produces clear, bright autostereoscopic images without the use of special glasses or other optical aids.

DTI is performing on two SBIR Phase II programs for NASA's Ames Research Center to produce prototypes of its advanced autostereoscopic tech-



nology. These programs will produce functional prototypes of: A Real Time, Full Resolution, Full Color Autostereoscopic Display; and a Full Resolution Autostereoscopic Display with Hologram-Like Look Around and a Wide Viewing Zone.

These innovations represent significant advancements in the presentation of autostereoscopic images which greatly enhance the realism of scenes and interpretability of 3D data. This 3D technology will be vital in a wide range of applications in government and civilian markets, including situational avionics displays, medical MRI, CT scan, and endoscopic imaging, scientific visualization, teleoperation, industrial inspection, and bioscience analysis.

DTI's advanced autostereoscopic technologies have to-date been embodied in engineering prototypes which must make the transition to "customer specific" prototypes then products. In some cases, DTI has stretched enabling technologies such as LCDs, optics and illumination to where some of these are also at the engineering prototype stage. In each case, a strategy exists to make these transitions.

DTI has a dual strategy. For 3D, it is to attract OEM customers with substantial market and distribution channels in place in target markets like situational avionics displays, medical endoscopic imaging, remote teleoperations and industrial inspection. To date, DTI autostereoscopic displays have been sold to potential OEM customers and markets validated in each of these target niches. These sales cycles are long; however, the prospects for full commercial production appear promising. For high definition, a technology fostered out of our NASA Phase II full resolution R&D efforts, the strategy is to secure a partner with LCD manufacturing capability and replace the standard back-lighting with photonic (unique combinations of lenses, lights and synchronizing electronics) subassemblies that bring functionality such as high definition, brightness, color and/or autostereoscopy to the LCDs. Eventually this program can lead to production of a whole new generation of LCDs.

## Donmar LTD.

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Margaret Goedeke, Chief Financial Officer and CEO  
Dr. A. Donald Goedeke, President  
Dr. John Storm, Vice President, Fire Protection Services

Donmar Ltd. conducts R&D in advanced technology related to fire protection, security, military systems analysis, and fire protection services. The company holds a major patent in artificial intelligence/machine vision. The company is also pursuing many projects in fire protection services, including in Europe.

Donmar has successfully developed, tested, and delivered an engineering prototype "Machine Vision Fire Detector System (MVFDS)" which operates in

the visible and functions in the same manner as a human. This new technology fire detector is a major breakthrough in advancing the reliability of fire discrimination against other sources of radiations that today cause existing UV and IR detectors to false alarm. The MVFDS also allows for very fast fire detection, typically 0.5 seconds or less in facility and aircraft hangar/shelter applications, but an order of magnitude faster for aircraft dry bay and engine bay fire detection. Unlike old technology detectors that do not "know" the source of the radiation they detect, or the location and size of the source, the MVFDS automatically "sees" and discriminates the fire as would a human, determines its distance/location, and knows its size/growth in real time. These factors will have great significance to selecting release of suppressant agent only where the fire is located and only when the fire has reached a predetermined size or threat. In addition, the MVFDS can be simultaneously operated in the video mode, thus portraying to an aircraft pilot, or a fire control officer, the actual fire after it has been categorized/detected. This provides for manual override, if wanted, or a suppressant release. It also provides, for the first time, a pilot-in-the-loop to verify a fire event in combat as well as in commercial transport. The detector uses off-the-shelf video cards, frame grabbers, microprocessors, Color CCD cameras, and electronics. Donmar Ltd. was granted Patent #5,153,722 on October 6, 1992. Full Scale Development (FSD) has been planned by the Air Force for aircraft applications as well as for ground-based hangar application and intrusion/security detection.

For aircraft applications, the MVFDS must be value engineered, designed to meet a large number of military standards, re-designed into a compact, dedicated electronics package (perhaps VLSI), and interfaced to a fast speed CCD via fiber optics (for aircraft dry bay and engine bay use). Also, new software is necessary for these fast speed applications (10 milliseconds or so). There are two ground-based market applications: Military and commercial. Size would not be a major factor in either case, but cost is. The electronics and configuration should be redesigned. Additional false alarm immunity software development and testing is also needed.

Donmar will acquire one or more partners with electronics, detectors, CCDs, optics, and manufacturing capabilities to assist in the further development and eventual marketing and manufacturing of the MVFDS. A company familiar with military standards and Quality Assurance (9858A or equivalent) is required. The partner(s) could license one or more applications and assume responsibility for various development efforts in parallel with those to be conducted by Donmar (e.g., software development). FSD funds would provide major support to the partner, but the partner would be required to conduct some R&D with its own funds, as well as to acquire specialists, if appropriate, in machine vision technology and computer image processing. It is uncertain at this point how to market the product for ground-based commercial and military use.

## DynaGen, Inc.

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Indu A. Muni, Ph.D., President and Chief Executive Officer  
Dhananjay G. Wadekar, Chairman and Executive Vice President  
F. Howard Schneider, Ph.D., Senior Vice President, Technology  
Peter J. Mione, Vice President, Clinical and Regulatory Affairs  
Judith P. Kitchell, Ph.D., Director, Biomaterials Programs

DynaGen, Inc. was organized in November 1988 for the purpose of developing and marketing diagnostic and therapeutic products for the treatment of infectious diseases, such as tuberculosis and malaria.

It is known that the human immune system frequently requires three or more exposures to an immunogen to stimulate lasting immunity. Thus immunization against certain diseases is presently conferred through vaccination programs which involve multiple encounters with trained medical personnel. Such vaccination regimes require strict logistical control, especially in the public health sector. An approach to reducing the logistical load is to modify immunization formulations for each vaccine so that a single dose confers complete immunity. The single dose formulation must reproduce the multiple dose effect by presenting multiple exposure events - such as are received with a series of "primer" and "booster" shots. The individual will require only one encounter with medical personnel to receive full immunization, thus reducing time expended by medical and record maintenance personnel, and eliminating the risk of failure to receive the "booster" dose. DynaGen has developed a formulation method which provides periods of dormancy followed by immunogen release. This dormant dose form has been dubbed a Sleeper<sup>TM</sup> dose. The Sleeper<sup>TM</sup> formulations are of simple composition, building upon the physical characteristics of the initial vaccine constituents. The vaccine components are incorporated into a matrix containing a biodegradable polymer.

The product requires additional development to optimize the dosing format, the level of dosing required and the suspending medium. Further development is needed on a multi-month Sleeper<sup>TM</sup> doses. Further toxicological work is needed.

The implementation includes partnerships with vaccine manufacturers in which DynaGen would prepare and provide prototype Sleeper<sup>TM</sup> formulations containing the partner's immunogens. Predclinical evaluation and clinical testing would be carried out by the partner. Production of the formulations would be negotiable.

## EDITEK, Inc. (formerly Environmental Diagnostics, Inc.)

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Burlington, NC 27215  
Tel (919) 226-6311  
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Mr. James Skinner, President and CEO  
Mr. Peter Heath, Vice President Finance & CFO  
Carole Golden, Ph.D., Vice President, Research & Development  
Mr. Mitch Owens, Vice President, Operations  
Mr. Michael Turanchik, Director, Research & Development

EDITEK, Inc. is an emerging biotechnology company with well-patented technology for the delivery of hand-held test kits for use in the detection of various biological and chemical materials. With over 30 products developed and released, our goal is continued expansion of product offerings and markets served by these immunoassay-based tests.

Working under a contract administered by the Naval Surface Warfare Center and jointly funded by the U.S. Army (ERDEC), the U.S. Marine Corps and the U.S. Navy, EDITEK, Inc. is developing membrane-based immunoassays for the detection of specific agents of biological origin in environmental samples. The multiple-step, enzyme-based EZ-SCREEN system is slightly larger than a deck of playing cards and contains all the materials necessary to test one sample and a control for the indicated biological agent or toxin. The self-performing, particle-based RECON system is smaller than a package of chewing gum and requires only the single step of sample addition. Total time required for test completion and interpretation in either system is 10 minutes. Development of tests for Botulinum Toxins A and B, *B. anthracis*, Staphylococcal Enterotoxin B and Ricin Toxin has been completed and test for additional agents are under development. The goal of the project is to merge tests for specific agent/toxin groups onto a single device that would provide individual test results for up to eight agents within 10 minutes following sample addition.

Development of specific reagents (antigens and antibodies) is required for each individual toxin, chemical or biological agent to be detected.

With more than 30 products on market utilizing the patented and proprietary technology manifested in its EZ-SCREEN®, VERDICT™, PREDICT™, and RECON™ products EDITEK already has a fully integrated manufacturing, distribution, quality control, quality assurance and regulatory affairs system in place. To maximize use of these resources EDITEK actively seeks collaborative research and development efforts with partners having a need for rapid, easy-to-use, on-site diagnostic screening tests for clinical agricultural or environmental applications.

In support of the products for detection of biological agents developed under the present Phase II project EDITEK is prepared to recruit and put into place a customer service team to interface with the U.S. Department of Defense, various related U.S. agencies and foreign countries designated by the U.S. government relative to provision of products under purchase contracts.

In those cases where developed tests have broader application such as in food safety testing or agricultural diagnostics, EDITEK will market products in North America through diAGnostic, Inc., a new company that is owned on an equal basis by EDITEK and Rhone-Poulenc, Inc., the French agrichemical giant. In Europe and certain Far Eastern countries, Rhone-Poulenc Diagnostics, Ltd., will be responsible for product sales, marketing and distribution. These assays may also be marketed for food and agricultural testing purposes in Japan by Chisso Corporation, a Japanese company currently marketing EDITEK agridiagnostic and food safety testing products in Japan.

## EIC Laboratories, Inc.

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Dr. A.C. Makrides, President  
Dr. R.D. Rauh, Vice President, Dir. Research  
Dr. Michael Carrabba, Director, Applied Spectroscopy Group  
Dr. Dennis Crouse, Technical Marketing Director

EIC provides research, development and new products/services in areas: 1) high energy batteries; 2) electrochromic displays and devices; 3) spectroscopic instruments for environmental and process analyses; 4) gas sensors; and 5) thin film materials.

EIC Laboratories is developing sensors, instruments and procedures for rapid, on-site "chemical fingerprinting" of environmental samples, such as soils, aquifers and waste repositories. With SBIR grants from DoE and DoD, EIC has been successful in demonstrating field-deployable, portable Raman spectrographs and fiber optic probes allowing sampling of restricted or hostile locations. EIC is currently testing the instruments and probes to obtain chemical profiles of soils in environmentally polluted areas. The same instruments and methods have applications in process control for the chemical, petroleum and pharmaceutical industries, in chemical weapons treaty verification and in chemical and biological research. EIC provides on-site services and instruments to industry and government.

Further development of instrumentation and software is desirable in some applications. EIC also seeks potential new markets in industrial process control.

EIC has extensive expertise in Raman spectroscopy, compact field-hardened instruments, and more generally in fiber optic spectroscopic and chemical sensing methods. EIC seeks industry-specific partners who can share in the development of process monitoring and control applications of fiber-opting Raman for their own operations. Fiber optic Raman spectroscopy and EIC's patented probes will provide solutions to many industrial problems; for example, in corrosion inspection (e.g., nuclear power plants), batch reaction monitoring (pharmaceuticals, fine chemicals, fermentations), petroleum blending

and refining, polymer curing, polymer sorting, hazardous waste identification and in analyzing optical purity.

## Electronic Imagery, Inc.

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Joe Osborne, CEO  
Cindy Seiffert, President

Electronic Imagery, Inc., goals are to transfer its high definition imaging technology to the information technology community, in an efficient and profitable manner.

This innovative R&D project will combine the most advanced image processing microchip hardware with leading image processing software, JPEC standard compression and Electronic Imagery's (EI) patented lossless compression algorithm. The OSIC IBM PC compatible graphics/image processing card will be designed for small size (laptop computers), provide speed, versatility, and expansion. It will occupy a single slot in a laptop computer, and employ Texas Instrument's most advanced graphic processor and multiple processing units for high throughput, bus master capability for peripheral control, and a programmable array processor for versatile I/O interfacing and expandability. The Imagescale application, similar to the one purchased by NASA and scheduled for use aboard the shuttle, is the most powerful image processing, enhancement, and measurement software available for the IBM PC based systems. The JPEG standard as well as Electronic Imagery's patented compression algorithms will be optimized for parallel processing on the OSIC to achieve high-speed image and data compression which will vastly increase the efficiency of data transmission and storage devices. The resulting combination of the 'OSIC' hardware and optimized applications software in a portable imaging computer will provide processing power currently found only on high end specialized workstations and mainframe computers.

Additional Development Needed: Funding for marketing and promotion.

Electronic Imagery (EI) is establishing marketing alliances with partners whose products and services work with EI's high definition software operating system. These marketing alliances aid EI to identify major accounts, provide referrals, and assist in imaging technology transfer.

EI's technology alliances ensure compatibility and functionality with interfaced products and full participation in tomorrow's markets.

The firm's strategic alliances enlist other corporations to aid in the transfer of EI's core imaging capabilities to emerging and developing markets and the identification of unique, promotable applications.

Current alliance activity is centered on solidifying relationships with the following computer hardware, software, and imaging industry leaders: Clarion, Gupta, Kodak, NCR/ATT, Novell, TrueVision, VideoLogic.

DI is staffed with career professionals with experience in high-definition television (HDTV), medical electronics, printing and publishing, graphic arts, pattern recognition, materials and testing, databasing, inventory and distribution, document imaging, law enforcement, finance and banking, aerospace and military scientific and biological research and general R&D.

The size and nature of the high definition subportion of the total imaging market is difficult to determine, as "imaging" varies greatly from industry to industry.

## Eltron Research, Inc.

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Anthony F. Sammells, President  
Eileen E. Sammells, Vice President - Administration  
Michael Schwartz, Project Manager  
James H. White, Senior Electrochemist  
John B. Olson, Senior Electrochemist

Eltron Research, Inc. (Eltron) is a small high technology company dedicated to performing basic and applied research in electrochemical, environmental and catalysis related technologies compatible for eventual commercialization.

This technology addresses the application of mixed ionic and electronic conducting ceramic membranes compatible with the spontaneous conversion of natural gas into either ethylene or synthesis gas, both of which are value added chemical products. The core technology developed at Eltron lies in an ability to rationally select solid state criteria which i) minimize the energy required to transport ionic species across the ceramic membrane (called the 'activation energy'); ii) identifying ceramic membrane crystal structures which possess a high concentration of sites through which these migrating ions can pass; and iii) solid state structures which simultaneously permit mediation of electrons.

All of these factors permit the subject reactions to process at practical rates and give these products at lower costs than currently available technology.

Additional Development Needed: Prototype and commercial development of ceramic membrane reactors.

Development of commercial products will be achieved by forming a separate corporation jointly owned by Eltron and selected investors (company). In return for an equity position to the investor group, Eltron will assign certain technology rights acquired to the separately formed new corporation.

## Epsilon Lambda Electronics Corporation

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Robert M. Knox, President  
Yonghui Shu, Design Engineer  
Suzanne O'Brien, Marketing Coordinator

**Company Purpose and Goals:** Commercialization of millimeter wave low cost transceiver subsystems. Industrial markets include vehicle collision avoidance radar. Defense markets include tactical weapons sensors and seekers.

Epsilon Lambda has already commercialized a 24 GHz radar subsystem which is now installed on Greyhound buses. The Phase III project would develop a 77 GHz radar subsystem which is suitable for automobile applications. The radar subsystem would employ Fiber Millimetrics technology which is patented by Epsilon Lambda and has been brought to maturity under several SBIR funded demonstration programs for DoD agencies. SBIR funding included examination of manufacturing technology, concurrent engineering, producibility and design for low cost. Phase III program will include market analysis, product definition, product development, manufacturing engineering, selling and distribution plan and start up production. Benefits of the product design are (1) first to market, (2) low manufacturing cost, (3) driver alert plus adaptive cruise control, and (4) ease of installation and maintenance.

**Additional Development Needed:** (1) Specific market driven transceiver/antenna design must be developed and subjected to cost and producibility engineering, and (2) software developed for system operation and radar signature analysis.

Epsilon Lambda is seeking primarily a financial partner to take equity position with Epsilon Lambda in a new company ELDAR Corporation. A financial plan with sales projections, product description and schedule has been prepared. ELDAR will make and sell collision avoidance radar systems for buses, trucks and automobiles. Selling will be to the after market in early years with expansion to OEM car makers as those opportunities develop. The partner, if appropriate, could participate in or help formulate the marketing and distribution strategy and system. The partner, if appropriate, could participate in some phases of system hardware manufacturing.

## Exos Inc.

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Dr. Beth A. Marcus, President

EXOS designs, develops, manufactures, markets and distributes medical measurement and rehabilitation products using patented robotics sensing technologies.

EXOS has developed two state of the art prototype master controllers for controlling robot hand and manipulators under the Small Business Innovation Research (SBIR) program with NASA. One of such devices is a two degree of freedom (DOF) Sensory and Force Reflecting Exoskeleton (SAFiRE) which is worn on the hand of a human operator. It measures the movement of the human finger and reflects the interaction forces between the slave robot hand and the environment back to the human finger. The second device is a position sensing Exoskeleton ArmMaster<sup>TM</sup> (EAM) that is worn on the human operator's arm. This device simultaneously tracks the motions of the operator's three DOF shoulder and two DOF elbow. Both of these devices are currently controlling robots at NASA. Currently, we are developing a five fingered SAFiRE and a force reflecting EAM under two Phase II NASA SBIR grants. This paper will include discussion of: 1) The design of the current prototypes, 2) phase II project objectives, 3) design issues that must be addressed in developing more advanced versions, 4) our progress to date in addressing these issues, and 5) general comments on the design of the EXOS force reflecting master controllers.

EXPORTEch Company, Inc.

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Dr. Robin R. Oder, President  
Mrs. Marcia R. Oder, General Manager

ETCi is a research and development company with expertise in comminution and liquid and particle separations technology whose objective is to develop technology to the point of license or sale.

Magnetostatic Coalescence: ETCi has demonstrated a new liquid phase separator of general applicability which can be broadly applied in both process and waste reduction applications in the petrochemicals, minerals and pharmaceutical industries. It employs a novel continuously operating magnetic method for separating immiscible liquids of virtually any concentration. Magnetic additives approved for use in foods and environmentally acceptable surfactants are used. To demonstrate the method, a stable emulsion of California crude oil containing 75% water with viscosity in excess of 1700 centipoise was processed at ambient temperature. Greater than 99.9% of the water was removed from the crude oil emulsion while more than 99.9% of the water-free crude oil was recovered. No heat is developed or used in the processing, no high tension electric fields are employed, and the total energy con-

sumption for the process is less than 2 - 4 kW-Hr/Ton of emulsion treated. This is less than 1% of the energy required to evaporate the water.

A specific niche for the technology must be identified for its first application. A pilot unit should be built and operated to develop application specific information on commercial feasibility.

ETCI seeks to identify a chemical, petrochemical, or engineering company servicing the chemical industry to join the commercialization of the innovative separations technology. ETCI will supply the technology, and the partner will support the development, supply the market recognition, and share the rewards. Successful commercialization will require identification of specific targets and market recognition in the appropriate industries. A partner from the chemical or petrochemical industries should be seeking new operations to:

- 1) produce new products or to secure cost advantages in its existing markets;
- 2) ensure waste stream minimization; or 3) develop technology for license or sale in the processing industry.

A partner from the engineering service community should be seeking to add new products and services for its marketing to clients in the chemical processing industry.

### Failure Analysis Associates, Inc.

8411 154th Ave. NE  
Redmond, WA 98052  
Tel (206) 881-1807  
Fax (206) 885-9628

Thomas J. Davis, Project Manager  
Craig C. Schoof, Director, Seattle Office

A Phase III relationship is sought for commercialization of an ultrasonic vision system.

Capability has been demonstrated for high resolution imaging in optically translucent or opaque media. Ultrasonic imaging methods are combined with a sparse, stationary array of sensors to reconstruct images of reflectors or object in the beam. Image reconstruction is accomplished with stepped-frequency ultrasonic holography. As a result, mechanical scanning of sensors is not required.

The project has been directed primarily at liquid metal applications such as molten sodium coolant in fast breeder nuclear reactors. The technology would also have applications in a variety of other media which will propagate sound. These applications could include turbid water viewing systems for divers, and remote underwater object location as an adjunct to side-scanning sonar. The technology may also form the basis of a night-vision system using air-coupled sensors.

The sensor array consists of a central diverging-beam transmitter surrounded by a single annulus of receivers. The transmitter is driven at a number of discrete frequencies, and object echoes are gathered and processed for each frequency. Image reconstruction is computationally complex but can ultimately be accomplished in near real time.

Additional development is needed to design and complete a pre-production prototype system for demonstration and for thorough determination of capability. This would include development of multichannel receiver hardware and optimization of imaging software/hardware for minimum image reconstruction time.

Implementation Strategy: A number of options are open. Failure Analysis Associates primarily seeks an arrangement which will provide further capital for refinement of the technology. The Phase III sponsor could attain return on investment through a subsequent royalty or marketing agreement.

## Failure Analysis Associates (FaAA Electrical Division)

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Mr. D. Galler, Managing Engineer (Principal Investigator)  
Dr. A. Kusko, Division Director  
Dr. R. Kadlec, Vice President  
Mr. M. Gaulke, President

Company Purpose and Goals: To provide engineering services in mechanical, electrical and metallurgical failure analysis, and to develop products and services for the safety, testing, and reliability service industries.

### Aircraft Accident Investigation Handbook for Electronic Hardware:

The primary purpose of the work is to prepare a handbook of accident investigation for the electrical and electronic components found on military aircraft. The handbook will contain procedures for identifying and handling evidence at accident sites, laboratory analysis techniques to interpret the evidence, photographs of new and damaged components, and component material properties. Wiring, connectors, switches, microelectronic devices, lamps, and other components will be covered in the handbook.

The following related work has been conducted for the project: Collected damaged electronic hardware from military aircraft accidents; assembled a literature database indexing several hundred key technical papers and textbooks on electronic failure analysis; and simulated and documented component failure modes related to accidents.

The handbook will also be converted to an electronic document with integrated text and graphics viewable in a PC-based Windows environment. The electronic handbook will provide several important benefits: 1) Enhanced productivity of field laboratory accident investigators, 2) decreased training time for staff, 3) the opportunity to transfer the document to a field portable computer for use at the mishap site, and 4) the opportunity to prepare more timely updates so the handbook can be kept up-to-date with military electronics.

Additional development work is needed to improve/add features which would make the electronic handbook more attractive to government/industrial users.

Some of these features are: 1) Conversion to a field-portable format, 2) hypertext to improve access to data, 3) multimedia insert integration for key visuals, and 4) expansion of scope to cover new components, procedures and support data.

Implementation strategy: To identify key government or industrial markets, provide specialized development of the data and implementation mode for those markets. Failure Analysis Associates is interested in additional funding and partnering arrangements with any organization with an inherent interest in air safety, electronic failure analysis, or technical documentation.

The work is currently funded by the US Air Force under Contract F33615-91-C-5612.

## Flam & Russell, Inc.

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Richard P. Flam, President  
Rickey E. Hartman, Vice President  
Dr. Lawrence R. Burgess, Vice President

FR exploits expertise in electromagnetics and software intensive systems to solve measurement problems in radar cross-section, antennas and non-destructive evaluation.

Application of high-resolution electromagnetic imaging, originally developed for the evaluation of stealth targets, to the inspection of a wide-variety of materials provides a new non-destructive evaluation (NDE) tool which is a complement to radiography and sonography. This technology utilizing computationally intensive algorithms, has been demonstrated to be effective at sensing and locating defects in carbon-reinforced composites and in performing high accuracy thickness measurements on low-density foam insulators. The technique can detect internal characteristics of dielectric (non-conducting) materials and surface defects in conductors. A complete NDE system costs about \$200,000 using off-the-shelf technology. This cost can be reduced significantly by developing application-specific hardware.

The technology has been demonstrated. Application specific instruments must now be developed which will be attractive to users.

FR wishes to develop partnerships with companies in the NDE field which can provide marketing and distribution capabilities. We also wish to develop application-specific systems for companies needing to solve particular NDE problems.

## Foresight Science & Technology, Inc.

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Port Townsend, WA 98368  
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Philip Speser, J.D., Ph.D., President  
David Speser, B.S.M.E., Chairman  
Bruce Chapman, Ph.D., M.B.A., Vice President, Industrial Engineer  
Elizabeth Rubin, B.A., Certificate in Bus. Admin, Vice President,  
Washington Operations  
J. Don Marioni, M.S., Aero Engineering, Certificate in Bus. Admin.,  
TQM Manager and Senior Industrial Engineer

**Company Purpose & Goals:** Foresight provides consulting services and related products to companies, universities, government agencies, non-profit institutions, and school districts involved with science, engineering, and technology. Services typically involve background research, strategic planning, implementation assistance, and are often supported by publications and/or customized software.

Foresight emphasizes the following areas: Marketing, Management Support, Manufacturing, and Research and Development.

Production Advisor will a) assist small manufacturers to analyze their manufacturing operations in light of general corporate goals; b) identify opportunities for improvements in manufacturing technology; and c) aid with evaluation and implementation of new technology.

Module One characterizes the company and clarifies its strategic concerns. Module Two constructs models of production processes and analyzes these models for improvement opportunities in light of the criteria established in Module One. It can provide two baselines for modification by the user (best practices and industry standard) or support user development of ground-up models. Supplemental look-up tables containing information on equipment for inclusion in the model can be provided or developed by the user. The Module provides a simulation of all or part of the company's manufacturing and a detailed diagnosis concerning technology transfer opportunities. Module Three is a data communications module that downloads the diagnosis and uploads findings concerning potential technology. Module Four evaluates any identified technology against the current technology. Module Five assists with implementation. A data base containing sources of assistance with implementation (financing, training, etc.) is integrated into the module.

Production Advisor is being developed with a graphical, user-friendly interface using C++. NIST is supporting the project under a CRADA.

Production Advisor should be available for purchase by Spring 1994. Final expert system rules are being developed and an extensive data collection effort to support baselines and equipment information is scheduled for summer. Code will be written in the Fall. Testing and revisions will occur during winter.

The development schedule could be accelerated if supplemental funding is provided.

For over 10 years Foresight has specialized in helping R&D intensive organizations fund R&D and transition/commercialize the results. To exploit current market opportunities, Foresight is diversifying by developing a product line of sophisticated support software for managers working with transitioning science and/or technology or adopting and implementing it in day-to-day operations. Initial emphasis is on software related to small manufacturing companies. The company's strategy calls for developing a line of low cost, high performance products by offsetting development costs with Federal R&D awards, contract research, and joint ventures. This strategy will allow for cut-throat pricing to rapidly build market share.

Phase III funding or a joint venture is being sought for developing a version targeted towards electronics or opto-electronics manufacturing — areas in which company principals have prior expertise. Phase III could involve equity investment, contract research with Foresight retaining marketing rights in exchange for shared royalties, or other options. Also of interest are contracts or joint venture opportunities to customize the program to:

- Improve manufacturing operations of the vendor pool for a single company regardless of industry, or
- Support technology transfer and/or knowledge dissemination by universities, university/industry centers, consortia, and manufacturers or manufacturing equipment.

Preliminary work is being conducted on companion expert systems. For example, to support commercialization and "technology push" activities, we are developing an expert system based on our proprietary methodology, Technology Niche Analysis. This technique is used to identify applications for R&D results or high technology products. A proposal for a related defense application (location of current and emerging commercial off-the-shelf technology) has been submitted to the Army. To support better management of interactions between science (theory, experimentation, instrument development), engineering, and technology deployment, a computer aided simulation game has been proposed to the Department of Energy.

### Foster-Miller, Inc.

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Dr. Charles Kojabashian, President  
Adi R. Guzdar, Vice President  
Ted Kirchner, Director, Materials Technology  
Dr. Larry Domash, Leader, Optics  
Dr. Harris Gold, Leader, Environmental & Medical Tech.  
Jay Boyce, Leader, Composites  
Rick Lusignea, President, Superex Polymer, Inc.\*  
Dr. Mark Druy, Leader, Fiber Optic Instrumentation  
Roger Demler, Leader, Thermal Technology

\* Superex Polymer, Inc. is a wholly owned subsidiary of Foster-Miller, Inc.

Company purpose and goals: Technology development in the area of materials processing, robotics, sensors, thermal and environmental engineering, medical instrumentation. Commercializations through joint ventures, licensing, strategic partnerships and spin-off manufacturing companies.

Foster-Miller, Inc. is one of the country's leading independent engineering organizations. Our normal business is designing products and manufacturing processes for commercial corporation and public utilities using an unusual multidisciplinary team approach. We have worked in a wide variety of SBIR technology areas where our multidisciplinary teams can use our techniques to attack real problems and develop commercially viable approaches.

Foster-Miller would like to partner with companies that have market expertise and can help our manufacturing affiliates, Superex (materials), Rapioex (robotic systems), and Vantage (utility products) better reach the end market. In several areas we have existing partnerships, typically focused on exclusive marketing arrangements for specific end markets, and are interested in financial support. We are particularly interested in talking with companies whose marketing expertise is in the following areas:

**Films and Containers:** Foster-Miller has demonstrated in pilot plant scale new capabilities in high barrier and high modulus films and containers, which also offer the promise of being unusually cost-effective. Some of these films are ideal for food and beverage packaging, electronic packaging and electrical insulation.

**Optics and Electronic:** We have a major effort underway involving several exciting technologies related to optical memories, switchable holograms, and optical data processing. The switchable holograms, in particular, represent a very low cost way of accomplishing optical interconnect and optical switching tasks.

**Sensors:** We have developed what we believe is the only remote, disposable, FTIR fiber optic spectroscopy attachment for chemical process and cure monitoring, environmental and medical monitoring. This approach can be realistically priced.

\* **Structural Materials:** In addition to the films mentioned above, which can be constructed as films, sheet, tubing, or honeycombs, Foster-Miller also has demonstrated capabilities in z-direction reinforcement of composites for delamination resistance.

**Environmental:** In addition to the sensor technology mentioned, Foster-Miller has demonstrated several other technologies related to detection and

cleanup of contaminants in water and a very cost-effective system for in-situ regeneration of activated carbon.

Medical: In addition to the sensor technology mentioned, Foster-Miller has demonstrated a low-cost sphincter manometer built around high-response solid-state sensors and has commercialized in Europe a system for fabricating dental restorations (Denticad).

Defense: Many of the above technologies are applicable to the defense market in the United States and internationally. In addition, Foster-Miller continues to offer innovative technology primarily for the defense market, including its innovative armor attachment system, LAST, and a low-weight, low-cost cooling system for use by the individual soldier when suited for chemical or fire hazard.

## Gamma Research Inc.

904 Bob Wallace Avenue, Suite 212  
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Tel (205) 533-7103

John Woo, Jr., President  
Daniel Woo, Vice-President  
June Woo, Secretary-Treasurer

Gamma Research conducts space and defense research and development, innovative development of high-speed rail passenger train systems, ground transportation feeder networks, solar energy resource analysis, and systems to control data accuracy in business practice.

The VODEM system for manual data entry and proofreading (visual verification) has been developed to dramatically increase accuracy and speed and to lower costs of both centralized and distributed data entry. Errors can be vitally expensive for critical data, and labor costs are the major expense for data entry. The Office of Technology Assessment estimates 25 percent of all paid working hours in the U.S. will be spent using a computer keyboard. VODEM is the first product specifically designed to address the problem of white-collar productivity in computer networks for data entry tasks. The technology is a TQM approach integrating SPC with human factors, imaging, MS Windows, OCR and new theories of human error in psychology. Screening and testing technologies have also been developed to select the best operators and to improve their key capture and proofreading attention skills.

Applications: In business practice, VODEM can be used in any task where at least 2000 characters of data per day are manually entered into computers or reviewed by management for accuracy and sign-off. This would apply to CIM systems such as EDI and JCALS in the Defense Department and in other networked information systems. Trends towards single-point data entry would greatly benefit from added control of accuracy. The major market is in centralized key entry data processing centers, where up to 36 percent of the total costs of data entry could be saved with accuracies equivalent to or exceeding that of key and verify. This technology provides methods to quality control



data entry at the user level and provides management the tools to develop standards for accuracy in computerized data interchange.

All necessary research in the VODEM Technology has been completed. Integration with imaging data entry applications is necessary for a commercial product. The integration costs are anticipated to be minimal when compared with the total cost of an imaging data entry system.

Gamma Research, Inc. is seeking joint ventures with major manufacturers of data entry equipment for commercial use and with system integrators to introduce these new methods into industrial practice. Venture Capitalists are sought with the vision to see that business practice in all the aspects dealing with data and paperwork could benefit from the institutional control of accuracy and the lower costs. As is well known, the Federal Government does not have any general policy on the control of manual data entry accuracy in computerized networks and databases. Indeed, even the national awards on quality do not address the problem of accuracy in databases. The VODEM Technology developed by Gamma Research under government contracts provides the tools for management to develop policies on the accuracy of data. This is a major business opportunity with the potential to increase our ability to compete in world markets.

The major cost savings from implementation of the VODEM Technology will occur as key plus key verification is shifted into VODEM OCR and proofreading, resulting in significant labor cost savings. Other cost savings include the increased productivity of VODEM key entry over standard key entry.

Gamma Research, Inc. is an 8(a) certified minority disadvantaged contractor under the Small Business Administration

### GDS Technology, Inc.

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Tel (219) 264-7384  
Fax (219) 262-0109

Dr. Aurora F. de Castro, Chairman and CEO  
Dr. Surendra K. Gupta, President  
Mr. Joseph Fraser, Vice President, Manufacturing  
Dr. Arun Agarwal, Chief Scientist, R&D

Company Purpose and Goals: To develop, market, and produce more diagnostic tests that are both cost-effective and improve the quality of care significantly.

GDS Technology, Inc. has received two SBIR Phase II Grants that resulted in two diagnostic tests for Point-of-Care market; (i) a blood ketone test measuring  $\beta$ -hydroxybutyrate for the diabetic market, and (ii) a blood theophylline monitoring test. The test system consists of (a) test card and (b) Stat-Site<sup>TM</sup> reflectance meter. Results are obtained by placing a drop of fingerstick blood into the center of the top side of a test card. The card is inserted into the re-

flectance meter, which in turn measures the color produced on the bottom side of the card, therefore allowing the quantitative measurement of the analyte in minutes.

The test for  $\beta$ -hydroxybutyrate offers for the first time an opportunity to measure "true" ketone in blood similar to glucose at the patient's site, which will a) avoid onset of ketosis/ketoacidosis; b) allows the ketosis in pregnant diabetic women; and c) better management of diabetic or alcoholic ketoacidosis

The test for theophylline offers a convenient method to measure theophylline levels in the physician's office so that the theophylline drug dosage can be managed more effectively and can avoid drug toxicity

Both tests are cost-effective and improved the quality of care significantly

Additional Development Needed: For ketone - none. For theophylline - transferring the technology from R&D to Manufacturing and Clinical Trials

GDS is looking for strategic alliances where a) the strategic partner who invests financially in GDS so that GDS can market the product aggressively, or b) the strategic partner who would also be the marketing partner who would sell and market our products into one or several markets: i.e., hospital, non-hospital and/or consumer market

## Genesis Research

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Dr. Thomas L. Owens, Research Engineer

Genesis Research Specializes in radio-frequency and microwave technologies. Our goal is to commercialize microwave devices for industrial drying and processing materials.

We have been developing a microwave kiln for drying wood. Freshly cut wood contains approximately 50-80% water. The water content in wood must be reduced to 5-15% to minimize warping and maximize strength and usefulness for all wood products. Most of the cost of processing wood is incurred in drying, which now takes from several days to several months. Our microwave kiln would increase the speed of wood drying by more than 17 times, without sacrificing wood quality. With major increases in drying speed, wood inventories are greatly reduced, as are the capital funds tied up in those inventories.

We have also tested microwave drying of clothes. Our focus has been upon commercial laundering. We have increased drying speed by a factor of ten in an experimental device. In addition to increasing speed, our concept can make microwave dryers extremely energy efficient in laundering applications. Considerable interest has already been expressed by potential customers in the dry-cleaning and industrial laundering industries.

Enormous undeveloped markets exist for microwave drying of both wood and clothing. Other promising applications, which we are currently exploring, in-

clude drying of industrial recyclable waste, and drying of paint applied to pre-finished siding.

## Giner, Inc.

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Dr. Jose Giner, President  
Dr. Tony LaConti, Vice President  
Mr. Larry Swette, Director, Engineering/Biomedical  
Dr. John Kosek, Director, Energy Conversion  
Mr. Paul Childs, Assistant Director, Systems Engineering

Company Purpose and Goals: Developing and productionizing electrochemical energy-conversion components and processes for 1) gas generation/control, 2) efficient power generation (fuel cells, super capacitors), and 3) environmental and biomedical monitoring.

Hybrid power sources that combine conventional batteries with electrochemical capacitors are being considered for transportation, communication and medical applications. Giner, Inc. is currently developing, under an NSF Phase II Grant (No. III-920096), a high-energy-density electrochemical capacitor, completely free of liquid electrolyte. The capacitor is comprised of a three-dimensional composite electrode structure, whereby an ionomer coats the individual metal oxide particles. The composite electrode structures are bonded to opposite sides of a thin sheet of solid proton-exchange membrane (PEM) ionomer and form an integrally bonded membrane and electrode assembly (MEA). The composite electrodes of the MEA are intimately pressed against thin electrically conductive current collectors to form a repeating element in a bipolar cell capacitor arrangement. Energy storage and discharge are achieved by utilizing double-layer and reversible redox processes. High energy density is achieved by using oxide particulate in intimate contact with a film of proton conductive solid polymer ionomer. The all-solid PEM ionomer-based electrochemical capacitor represents a potentially more reliable, safer and longer-life alternative to the typical liquid electrolyte electrochemical capacitor systems. All-solid ionomer capacitors have been prepared having a capacitance of 2.0 to 2.7 F/cm<sup>2</sup> and 300 to 450 F/g. Projected energy density is 10 to 15 joules/cm<sup>3</sup> and 5 to 10 kilojoules/kg.

Giner, Inc. has filed for and obtained a patent (U.S. Patent No. 5,136,474) for the proton-exchange membrane electrochemical capacitor. We have fabricated packaged pre-prototype devices and demonstrated highly invariant performance for over 2 years with no incidence or maintenance. During the Phase II program, we expect to improve the capacitor energy density and develop more cost-effective materials and prepare advanced prototypes to demonstrate the potential of these devices for transportation applications. For Phase III, our goal is to work with a capacitor manufacturer on productioniz-

ing and advanced packaging of these novel devices for transportation and other high-energy-density applications offering a large market potential. The role of Giner, Inc. would be in 1) licensing of the technology and 2) fabricating the cell elements for the capacitor and providing technical support for the product.

### Globe Rubber Works, Inc.

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Richard Somerville  
James Young  
Ralph Brett, Vice President

GRWs purpose is to develop matrix type polymers and manufacture them into problem solving products for industry using our low tooling cost technology. Some of our material and products have been used in vibration cancellation, noise cancellation, replacement of metal products, shock protection, and many other non-metallic applications with many industries.

The manufacture of closed cell syntactic foam using polyurethane polymer matrix and various high void content fillers to produce a material of sufficient compressive strength and stiffness to resist the hydrostatic pressure encountered by submarines yet posses the ability to attenuate the shock wave of underwater explosions. Such materials are capable of protecting sensitive electronic components and periscope windows from attack.

GRW has manufacturing capabilities to mold polyurethane, rubber, or composites.

### GMS Engineering Corp.

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G.M. Samaras, Ph.D., DSc, PE, CEO

Company Purpose and Goals: Engineering Research & Product Development.

The Modular Intelligent Data Recorder (MIDR) is a general purpose data acquisition and control system. It is modular, portable, rugged, battery operable, and user programmable. A key feature of this laboratory quality system is its modularity, permitting simple and rapid reconfiguration in the field. The MIDR has extensive communication capability (2 serial, 1 parallel, and 1 GPIB port). A menu-driven user interface permits simple system configura-

tion, operation, testing, signal review, data retrieval, and device programming. The front ends consist of up to 64 high gain, low noise programmable differential amplifiers with digitally-programmable, analog state variable filters. The 16 bit digitizer has a 64 KHz aggregate throughput rate - this includes random channel sequencing, changing amplification and offset, and data storage in memory or directly to a communications port. In addition to 256 KB user program memory (SRAM), up to 256 MB of low power data memory (PSRAM) are supported in 32 MB modules. The MIDR may be custom programmed or operated with existing PROM-based commands, either tethered or untethered from a host PC. Consisting of stackable modules, each module is 12" x 6" x 1" (except for the power/battery module, which is double height) and weighs about 30 oz. A typical 32 channel, 32 MB configuration would consist of 6 modules; a 64 channel, 128 MB configuration would consist of 11 modules.

The current host PC menu system operates under MSDOS; operation under Windows would be nice. The current housing consists of anodized aluminum, EMI/RFI shielded module housings; a non-modular, PC type housing might appeal to a market niche that does not work in the field.

Implementation Strategy: We are quite flexible; we will consider anything from a joint venture to outright sale of the production-ready technology package.

## Gradient Lens Corporation

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Rochester, NY 14608  
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Duncan T. Moore, President  
Leland G. Atkinson, III, Vice President, Engineering  
Douglas S. Kindred, Senior Scientist

Company Purpose and Goals: Commercialization of gradient index optical materials in the precision optical industry.

GRadiant INdex (GRIN) optical materials have been developed which allow complex optical systems to be simplified and improved. Axial GRIN materials permit aberration correction similar to that of refractive aspheric surfaces, but only require the fabrication of spherical surfaces. Radial GRIN materials can be used to replace up to 40 optical elements with a single GRIN element. Chromatic properties of the GRIN materials can be controlled with effective Abbe V numbers ranging from -250 to -30 and 10 to 150.

GLC's GRIN technology has been developed under two SBIR programs with the Army, one SBIR program with NSF and additional private funding. Axial GRIN optical materials in diameters from 10 to 80 mm and Radial GRIN optical elements from 2 to 10 mm are available for use in visible and near IR optical systems. Prototype systems using GRIN technology have been built for Military Fire Control and Consumer Medical applications. A diverse menu of GRIN optical materials along with design, production and quality control sys-

tems are in place to facilitate use of GRIN materials in advanced optical systems.

The GRIN manufacturing process is protected through both a patent position and proprietary process art.

Gradient Lens Corporation is in the process of scaling up production facilities and developing additional GRIN optical materials. Additional financial and technical assistance in both of these areas is needed.

Gradient Lens Corporation is looking for partnering opportunities with both military and commercial manufacturers of advanced optical systems. Our implement strategy is to locate niche applications for GRIN materials which can be used as a base to enter new optical system markets. A key evaluation criteria which will be used by GLC in evaluating partnering opportunities is the ability of a potential partner to dominate a specific market segment and the vision to see the benefit of GRIN materials wide use in other optical system market segments.

Joint ventures, partnerships and strategic alliances are all possible business formats to exploit the GRIN optical materials technology. In any business venture, GLC intends to maintain control of the basic GRIN optical materials manufacturing process. Licenses for second source manufacturing may be available in specific situations.

## Heuristicrats Research, Inc.

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Andrew Mayer, President  
Aleus Gollu, Vice President, Development  
Othar Hansson, Vice President, Research

Heuristicrats Research Inc. (HRI) is an innovative, technology-driven small business specializing in solving complex computational problems. Our methodology provides total solutions that span problem analysis, specification, design and implementation of systems that can be targeted to users of varying expertise. Our mission is to provide both technical innovations and the software engineering required to make these new technologies commercially viable.

The Decision-Theoretic (DTS), HRI's Phase II NASA SBIR effort, is targeted to delivering a software prototype that will optimize experiment scheduling operations for NASA's space telescopes, principally their Extreme Ultraviolet Explorer. DTS derives its technological advantage over existing scheduling techniques by exploiting HRI's advances to the state-of-the-art in combinatorial search algorithms. As a fundamental improvement in scheduling technology, DTS promises to support numerous applications of scheduling and constraint-satisfaction processing within government and industry.

DTS is implemented on top of existing toolkits for probabilistic inference and search, and includes an extensible modeling language for scheduling problems and a customizable graphical user interface. HRI is positioning itself to exploit this nucleus of software modules to provide rapid prototypes of DTS-based solutions to other scheduling and optimization problems, and to develop customized and optimized versions of DTS to suit individual client needs. DTS currently runs on industry standard UNIX workstations (e.g., SPARC-10), under both the Open Look and Motif graphical environments. It has been designed to run on a distributed environment, where the optimizer may reside on a supercomputer while the graphical interface is run on a low end personal computer.

HRI seeks business partners with the foresight to invest both the capital and the domain expertise required to adapt our technological advances to solving their business problems. We are eager to build relationships with technology-minded clients who feel that they can secure decisive competitive advantages in their industry by realizing an order-of-magnitude improvement to their scheduling/optimization operations. Specific industries in which such potential exists, and in which HRI is currently exploring the application of its scheduling/optimization technology include: Transportation (e.g., airline scheduling), manufacturing (e.g., job-shop scheduling), telecommunications (e.g., network management), and financial services (e.g., data analysis).

## HNC, Inc.

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Dr. Robert Hecht-Nielsen, Chair of the Board  
Robert L. North, President  
Michael A. Thiemann, Exec. Vice President  
Todd W. Gutschow, Vice President

HNC is focused on the application of neural network technology to high-value commercial and defense problems in the areas of decision making, text retrieval, and image processing. HNC also develops hardware/software systems that enable high-speed execution of neural network algorithms.

Real time information processing of the battlefield encounters bottlenecks in areas such as sensor fusion, target recognition, image processing, signal processing and novel sensor processing. Traditional workstations run out of horsepower when facing such problems. HNC's new general purpose SIMD Neurocomputer Array Processor (SNAP) provides the parallel processing power for real time response to solve these problems.

Developed under an SBIR program entitled "Army Battlefield Neurocomputer" sponsored by the Army, the SNAP is based on a new parallel processing chip employing a Single Instruction Stream, Multiple Data Stream (SIMD) architecture. Each chip contains four processing nodes capable of perform-

ing IEEE single-precision floating point operations at a rate of 40 megaflops per node. Four chips are designed onto a single SNAP linear array board and up to four such boards can be configured into a SNAP system. Thus, SNAP system can deliver between 640 megaflops and 2.4 gigaflops of processing power.

The primary benefit of the SNAP is its price/performance ratio. A two board SNAP system capable of 1.2 gigaflops of processing is currently available from HNC for \$50,000 including software. This makes the SNAP a very attractive option for bringing supercomputer performance to the desktop environment and/or embedded applications.

The SNAP hardware is fully developed and shipped as an HNC product

HNC is interested in development relationships with a variety of companies that might be interested in the SNAP hardware. Potential relationships include value added resellers (VARs), original equipment manufacturers (OEMs), and project teaming on Government and/or civilian programs.

## Ice Corporation

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Manhattan, KS 66502  
Tel (913) 776-6423  
Fax (913) 776-6424

William H. Dawes, Vice President / Principal Investigator  
Patrick W. Connelly, President

We at ICE like to publicize and display the advancements designed into our SBIR developed "High Power Switches." Our intentions are to find support from the private sector for commercialization.

A family of five direct current switches were developed that included overcurrent and overtemperature protection. The family ranged from a 163 volt 5 ampere switch to a 400 volt 100 ampere switch. All switches were produced as thick-film hybrid circuits. The five switch types required two package styles. The 5, 10 and 25 ampere switches were constructed in a 1" x 1" x 0.25" package, and the 50 and 100 ampere switches were constructed in a 4" x 2.5" x 0.31" package. Each switch is designed to control a load that is grounded at one side; that is, the supply voltage is switched. Current sensing is accomplished by a thick film resistor printed on the ceramic substrate along with the rest of the circuit resistors. Aluminum nitride substrates were used in the 25, 50 and 100 ampere circuits because of its superior thermal conductivity over alumina. Rise times of 20 microseconds or less and fall times of 500 nanoseconds or less were accomplished on all switches. The 5, 10 and 25 ampere circuits are hermetically sealed. A commercially available package for the 50 and 100 ampere switches was not found so one was fabricated from kovar (baseplate), alumina, aluminum nitride and kovar electrodes, and is not hermetic.

The 5, 10 and 25 ampere switches require little further development. The 50 and 100 ampere switches are production ready, but the package needs fur-



ther testing to verify its design. All five switch types need further testing to insure long-term reliability. Additional circuit improvements have been designed that would extend the operating voltage range.

ICE is in the process of patent application and would prefer to license the manufacture of the switches. ICE has a small thick-film hybrid circuit capacity, but as presently organized may have difficulty meeting a large demand of several hundred switches a day. ICE would prefer to keep further development of switches within the U.S. Two areas of expertise are needed to bring these switches into mass production; packaging experts to review, critique and improve upon the packages, especially the 50 and 100 ampere switches, and mass production facilities.

The switches could be used in any DC switching application. A reasonable example is in the rising field of electric vehicles which require the pulsing of electric motors - a feat not well suited for electromechanical devices and tailor made for semiconductors.

### Immunodiagnostics, Inc.

562 1st Ave. South  
Seattle, WA 98104-2866  
Tel (206) 628-2994  
Fax (206) 628-3228

Thomas M. Buchanan, M.D., President  
Mark T. Buchanan, Ph.D., Vice President  
Debra Chambers, Secretary

Company Purpose and Goals: To manufacture and bring to market a ten-minute, two step AIDS test that accurately detects antibodies to both HIV-1 and HIV-2, and can be easily performed. This test is suitable for use by small laboratories, health care professionals, the military, institutional staff, or by individuals in the privacy of their homes.

A ten minute AIDS test that detects antibody to both HIV-1 and HIV-2 and can be easily performed by individuals in the privacy of their homes, is in the final stages of development by Immunodiagnostics, Inc. (IDx). In the first step, blood from a finger stick is dropped into a well on the test device and the user waits three minutes. In the second step, buffer is added to a second well on the test device. The test is complete after an additional seven minutes.

A blue line develops in the device window if antibodies to HIV-1 are present and a red line indicates antibodies to HIV-2. Three additional control lines develop in a separate window to document that all reagents in the test are active. This confirms the validity of test results which indicate no HIV antibody.

The AIDS diagnostic test employs precisely characterized synthetic peptide-protein conjugates, which have been found highly potent and accurate in tests with more than 2000 sera. The IDx test can be manufactured and assembled with automated procedures, and the dried state of all key reagents allows prolonged shelf life at room temperature.

This test may contribute to eliminating the spread of AIDS by providing a technology that allows individuals that are currently not being tested to become aware of their HIV status.

Approximately 5% of full development remains to be completed. This includes additional scientific and business data to be collected to complete proof of feasibility.

The six years of experience within IDx regarding all aspects of manufacture and quality control of this test and its reagents dictates that IDx continue to provide leadership for manufacture and quality control. Joint ventures, partnerships, or strategic alliances are sought in which the IDx partner will not only provide financing, but will also bring established experience in the marketing, distribution, and sales of diagnostics and/or therapeutics to small laboratories, physicians, and individuals.

### Information Technology & Applications Corp. (ITAC)

1875 Campus Commons  
Reston, VA 22091  
Tel (703) 391-8822  
Fax (703) 391-8879

James E. Scrivener, President  
Roderick J. Pejsar, Vice President  
R. Milton Worthy, Vice President  
Robert C. Miller, Vice President

Company Purpose and Goals: Information support through workstation development (software) and SatCom engineering to government and commercial clients.

Information Technology & Applications Corp. (ITAC), under contract to the Directorate for Night Vision & Electro-Optics at Ft. Belvoir, VA, has developed a fieldable PC-based workstation which uses satellite orbitology computations, map overlays and spectral comparisons to answer such questions as how much and what types of information can be obtained from commercial imaging systems (pan and multi-spectral) that would be useful to military commanders or others. Of interest, resolutions of better than 5 metres and specialized sub-pixel spectral signature derivation are now a possibility.

ITAC's workstation, called "SCAM V1.0," either operates as the Surveillance Countermeasures Application Manager or as the Space-Based Collector Activity Monitor, and is designed to provide the User with the ability to accurately overlay ground system assets on a highly flexible map-image background and then query the workstation as to coverage and collection risk for specific targets, times and dates using real-time models of space sensor systems. SCAM V1.0 software is contained on nine diskettes and can be loaded and used in most late-model PCs. Coverages are indicated by the rapid calculation and overlay of space-system ground-swaths and the color-coding of placed weapon assets that are technically collectible by the space system. The risk or collection capability assessment is carried out by comparing ma-

trix databases containing system sensor capabilities and weapon element spectral emanation characteristics and levels. In the Version 2.0 of SCAM, high-resolution global-coverage map sets, together with functionality to handle the new DMA-standard ADRG colored maps, is being incorporated with selectable SPOT Image frames (to NITF standards), thus giving a new capability that allows advanced mission planning and analysis with juxtaposed high and medium resolution maps, imagery, footprints and text. The ADRG software provides a "hook" into the new ADRI imagery functionality, which allows the relating and presenting of imagery and terrain elevation data.

Version 1.0 delivered to the U.S. Army. Version 2.0 under development, delivery Fall 1993.

SCAM utilizes Object Software Development modules, any of which can be pulled out, recombined into other workstation packages and provided for customer use in quick-time, at minimum expense. This means that map packages, orbitology packages and comms links can be provided to SCAM and to any other workstation combination, or can be made a part of other workstations utilizing PC/MS-DOS/Windows technology. Any company that utilizes PCs, SUNs, or other similar machines can use ITAC's software modules. This is the advantage of object-oriented software development in C++.

## Innovative Research, Inc.

180 Cook Street, Suite 315  
Denver, CO 80206  
Tel (303) 321-4955

Dr. Mohsen Pazirandeh, President

Innovative Research is engaged in design assessment of modern computer systems, especially supercomputers and parallel systems. We also develop tools in support of these efforts. One tool developed under several SBIR contracts is ready for commercialization.

Environment for Simulation of Distributed Systems (ESDS) is a software package for evaluating the performance of Von Neumann, distributed, and parallel computer systems. It is developed under several SBIR Phase I and II contracts. ESDS is aimed for use by a wide range of systems developers, engineers, and scientists. The major features of ESDS are as follows:

- Most system elements are defined in libraries that can easily be extended, updated, and edited.
- Application elements can easily be assigned (or reassigned) to system nodes, to ease system reconfiguration and the exercise "what if" questions.
- Subsystems can be designated as Composites and used as icons for constructing larger systems. This has a number of advantages; e.g., the ability to analyze subsystems separately, system model following the system life cycle.

- A number of software hooks will enable a user to perform special purpose analyses; e.g., simulating a set of code, analyzing the behavior of a device in details, executing benchmarking routines, or performing specialized statistical analyses.
- Two knowledge bases will assist the analysts in designing more efficient systems by optimizing system performance and tracing performance failures to their causes.
- A library of algorithms supports analysis needs and contains algorithms for the description of system operation, statistical routines for performing simulation, and analytical models.

Several major enhancements to the package are needed. We are looking for both technical and financial support to further develop the communication, fault isolation, and on-line help components of the tool.

Key to a successful partnership is the ability of both sides to benefit from it. A partner can benefit from ESDS in two ways: (1) Using it as a design assessment and verification tool, and (2) strengthening a proposal by including ESDS as a proprietary product. ESDS will have a broad customer and user base that includes both the industry and the Government. Innovative Research needs assistance in reaching these markets. Our strategy in reaching these markets is to approach them in two ways: Technical and commercial. Technically we will (1) follow the trends in industry and the introduction of new computer architectures and application design methodologies, and enhance ESDS to reflect these new developments, and (2) customize ESDS to meet the specific needs of various users. Commercially we will develop a strategy to reach a broad spectrum of potential users. Although financial support is important to us, we are primarily looking for partners who can help us achieve these goals. Technically they will give us feedback on the capabilities of the tool and ways to improve and enhance it. Commercially they will provide us with marketing ideas and help us with the commercialization of the product.

## Integrated Applied Physics, Inc.

50 Thayer Road  
Waltham, MA 02154  
Tel (617) 489-1818  
Fax (617) 489-3521

Dr. George Kirkman, President  
Dr. Martin Gundersen, Chairman  
Nicholas Rienhardt, Engineering Manager  
Dr. Jung Hur, Engineer  
Dr. Josef Yampolsky

Company Purpose and Goals: Research, development and commercialization of high voltage pulsed power and electron beam systems for pollution control applications.

Integrated Applied Physics, Inc. designs, develops and manufactures pulsed high voltage systems for pollution control and other applications. Our systems provide an economical, efficient implementation of non-thermal plasma treatment of effluent gases using corona discharge to reduce emissions of SO<sub>2</sub>, NO<sub>x</sub> and other hazardous air pollutants. The systems can be applied to fossil fuel burning power plants, diesel engines and emissions of industrial and environmental clean-up processes. The systems implement our SBIR developed high voltage switching and circuit concepts to provide higher efficiency and reliability in these applications. Our pulsed high voltage systems produce electrical pulses of over 100kV, 10kA and repetition rates of 200Hz in short pulses with 50nsec rise time. These pulse generators are also applicable to accelerator, RF power, electron beam, X-Ray and other systems.

## Integrated Sensors, Inc.

255 Genesee Street  
Utica, NY 13501  
Tel (315) 798-1377  
Fax (315) 797-9826

E.J. McDermott, President

Integrated Sensors, Inc. develops multisensor algorithms, sensors and multisensor system configurations.

In 1992 ISI was awarded four SBIR Phase II Contracts in which it has developed two prototype products for commercial, military applications.

Product #1 (Object Position and Attitude Determination [OPADSI]) is a non-contact motion tracking and analysis system with application to the bio-medical and robotics fields.

The OPAD system tracks an object in real-time and provides measurements of the object's position and angular orientation. A single camera, an AT-bus compatible processor, and an ISI decal are all the hardware required. Attach the decal to the object you wish to track and the OPAD system will do the rest. It provides a real-time track with position, velocity, angle and angular rate outputs for servo-control or interactive management of the experiment. Or it will store data for use with the ISI post processor, which provides accurate and timely estimates of acceleration.

Product #2 is a flat panel phased array for Direct Broadcast Satellite TV and lightweight man portable radars.

ISI is developing lightweight/low-cost planar arrays in multilayer RF media for satellite communications and radar applications. These lightweight, low profile arrays (2 inches) are a superior alternative to conventional parabolic reflector designs. Effective sidelobe control, wide band width radiating elements, and electronic scan along one or two axes is achievable at competitive costs.

OPADS requires very little development and is ready for B testing.

DBS phased array requires additional engineering development.

OPADS product will be spun off in a subsidiary with opportunity for equity investment. Partnership for marketing, licensing, or other arrangements are open. Anticipated annual sales for the next 1 - 2 years is \$5-8M.

DBS phase array has a joint venture/alliance opportunity for the potential US Army production of 2000 - 4000 production units and we seek investors for the DBS commercial application. Production sales estimates for the light-weight portable radar is \$200M and annual sales for DBS is \$26M in four years.

Companies with processing, phase shifter and photonics technology are sought for cooperative arrangements

## Intelligent Automation Systems, Inc.

142 Rogers Street  
Cambridge, MA 02142  
Tel (617) 354-3830  
Fax (617) 547-9727

Steven Gordon, President  
William Nelson, Applied Mathematician

Company Purpose and Goals: To help American manufacturers be more competitive through the development of new technologies.

The Four Dimensional Imager (4DI) is a low-cost sensor capable of making three dimensional measurements of objects in a continuous manner. It uses a projected pattern of laser light, multiple CCD cameras, and a high-speed computer to reconstruct three dimensional scenes in real time. It is robust to various ambient lighting conditions and may be used in industrial, space or underwater environments. It is also extremely rugged since there are no moving parts. It has the unique capability of making 3D measurements of moving objects, since data capture rates can be as low as 1/10,000 of a second.

The technology development for the 4DI system is completed and has been demonstrated in an automated robotic assembly application in the laboratory. The 4DI has numerous applications including space and terrestrial tele-robotics and remote sensing, underwater inspection, solder-paste-volume inspection, mechanical and electronic assembly, non-contact coordinate measuring machine probe, aircraft and marine vessel hull inspection, and human-body feature measurements.

Development of the basic technology and fully operational prototype is completed. The system will likely need customization for particular applications.

Intelligent Automation Systems (IAS) is seeking a strategic alliance with an organization which has current involvement in an industry which would have a sizable market for the 4DI system. IAS will manufacture calibrated sensor heads which may be integrated into almost any computer or control system.

## Intelligent Machine Technology Corporation

2313 West Arkansas Lane, Suite 103  
Arlington, TX 76013  
Tel (817) 261-3595  
Fax (817) 261-1256

James D. Billingsley, President

The purpose of the company is to develop multi-use intelligent machine technology. These machines are aware of their situation and have algorithms and other knowledge that allow them to evaluate options for completing assigned objectives. The goal of the company is to develop technology and products that are useful in both military and commercial markets.

### The STAG Project—Smart Autonomous Guidance Technology:

Precision all weather autonomous guidance is a long sought, now achievable, goal for military and commercial aviation, ground vehicles and ships. This project is developing an integrated imaging-inertial guidance system that combines imaging sensors and inertial components with image flow algorithms, information analysis algorithms and situation control guidance techniques. Adaptive mission management methods based on in-flight acquired information will help avoid detection and interception in military applications and will avoid many communications and weather related problems in commercial applications.

The baseline concept contains: Passive millimeter wave and/or other imaging sensors and low-cost inertial navigation components; a multi-processor computer with an object-oriented operating system, real time software for signal processing, navigation and mission management; moving monocular scene tracking, ranging and mapping algorithms; an earth model containing terrain elevation data, gravity vector, a calendar and time of day clock.

These elements are integrated to achieve all-weather precision, closed-loop, terrain elevation tracking and navigation along with six degree-of-freedom (twelve parameter) flight tracking. The objective is to achieve less than one meter position accuracy and less than one milliradian angular accuracy during all critical phases of the mission.

The STAG project will confirm, through hardware-in-the-loop simulations, that the imaging-inertial algorithms perform as expected. Real time data acquisition and processing will need additional development and specific applications of the technology will need to be developed.

Under separate contract IMTECH is developing an all-weather passive millimeter wave imaging sensor that is suitable for use with the imaging-inertial processing algorithms. Also, because of image resolution limitations at millimeter wavelengths, post processing algorithms have been developed that increases the image resolution by a factor of seven better than the Rayleigh diffraction criteria. We are also developing object oriented parallel distributed process control software that is being demonstrated in the STAG simulation. We need to establish business relationships with end users, prime contractors and other companies to aid in maturing the technology and developing specific military and commercial products.

## International Software Systems, Inc.

4821 Spicewood Springs Road, Suite 103  
Austin, TX 78759  
Tel (512) 346-2277 ext. 805  
Fax (512) 346-9452

Dr. Raymond T. Yeh, Founder, CEO

**Corporate Vision:** Be a premier provider of productivity enhancing technologies, tools, and services in the areas of process engineering and systems and software engineering environments.

The NASA/Specification-To-Executable-Program (NASA/STEP) Phase II SBIR is refining a visual programming environment that is integrated with traditional software tools. It provides explicit reuse of both designs and existing code, and addresses improvements in achieving commonality among payload control processing capabilities. NASA/STEP provides a capability for very rapid prototyping of systems and components, modeling, run and test, fine-tuning of prototypes, building of a reusable library, and automatic multi-tasked C++ code generation. The NASA/STEP tool will be able to generate a domain-specific, fully distributed target system that is widely applicable to multiple domains.

**Additional Development Needed:** Provide a virtual Data Base layer (to provide support for a variety of OODBs, RDBs, and flat files), integrate with reverse engineering and re-engineering tools. Upgrade to provide additional flexibility in architecture. Enhance to client-server in the simulation and code generation sections of the tool, and integration of COTS network-oriented services.

**Implementation Strategy:** Form strategic alliances for customers and distribution channels.

The Domain Specific Software Process Automation Technology (DSSPAT) Phase II SBIR is developing a prototype of a process simulator for modeling an organization's or project's software process. Based on successes in Phase I using the Visual Process Modeling Language (VPML), the simulator will provide the ability to visually model a process, attach metrics and data to it, simulate this instantiation, and analyze the results to determine a satisfiable process. Benefits expected from this SBIR include: Processes can be rapidly prototyped at low cost, bottlenecks and deficiencies can be identified and corrected early, resource allocation and performance prediction are carried out systematically, and simulation analysis can be used for process improvement and optimization. DSSPAT is being developed in an open systems architecture using the X-Window System and UNIX. An immediate program objective is to integrate the simulation and modeling capabilities of DSSPAT with PROVision (Process Vision), a software process definition, instantiation, and enactment tool currently under prototype development at ISSI. A long term objective is to provide the capability for integration with a variety of commercial Software Engineering Environments (SEE).



Additional Development Needed: Integration with project management, metrics tools, and spread sheets to further facilitate the ability of managers to do rapid "what if" scenarios.

Implementation Strategy: Strategic alliance with systems integrators and vendors for tool integration and distribution.

## International Solar Electric Technology (ISET)

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Inglewood, CA 90301  
Tel (310) 216-4427  
Fax (310) 216-2908

Dr. Vijay K. Kapur, President  
Dr. Bulent M. Basol, Vice-President

Company Purpose and Goals: Commercialize low cost, thin film photovoltaic modules fabricated on light weight flexible substrates.

Under the NASA/SBIR funding ISET has been able to demonstrate a process of fabrication for thin film, low cost, Copper Indium Diselenide (CIS) based PV modules on light weight flexible substrates. Currently, ISET is optimizing this process for the fabrication of monolithically integrated CIS modules of area 1 ft<sup>2</sup>. CIS based solar cells are very stable and laboratory conversion efficiencies for these cells have been recorded at 15% for AM1.5 and about 12% for AM0. ISET's patented technology for CIS modules lends itself very well for dual use in defense and terrestrial applications. Cost of manufacturing CIS based PV modules on rigid substrates with output 10 watts/ft<sup>2</sup>, has been estimated to be 1.00/watt in a 10 MW/Yr operation. ISET is seeking partners to commercialize this technology.

Additional Development Needed: ISET will have prototype CIS modules (1 ft<sup>2</sup>) on light weight flexible substrates by mid 1994.

Implementation Strategy:

- Form a joint venture with a company/venture capital group, interested in financing commercialization of this potentially very large business of non-polluting renewable energy generation.
- Form a strategic alliance with a company doing business with DoD/NASA, especially involved with space power and remote power applications. Focus of this alliance will be to develop defense and space markets for flexible light weight PV modules.
- Form a strategic alliance with a company involved with terrestrial applications of PV systems. Focus of this alliance will be to develop remote power and roof-top applications for low cost modules.
- Potential partners for strategic alliances would be welcome to invest in the commercialization of this technology.
- ISET will provide technology, run the module manufacturing operation and continue with advanced technology developments in this field.

## International Space Systems, Inc.

1000 Airport Road, #31  
Huntsville, AL 35802  
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Fax (205) 880-1174

Gerald Wittenstein, President, CEO  
David Olivet, Aerospace Engineer

International Space Systems, Inc., is an Aerospace Engineering and Software Development company generating and delivering excellent Software and Engineering Services in the areas of Mission Planning and Scheduling, Data and Configuration Management, and Operations Support.

The Change Identification and Review System (CIRS) is a configuration management tool which provides the environment for an individual engineer within a team of reviewers to extract changes from a source document and to perform a variety of analyses on these changes. CIRS represents the integration of several COTS packages (a change identification program, the user's favorite word processor or text editor, a form population package, and a database management system) with several newly developed modules (a change extraction module, and report generation modules) under a graphical user interface with an on-line, context sensitive help system. The unique aspects of this technology are the change classification (which allows the user to view only changes that are of interest), the document generation (which saves storage space by only saving the most recent version of a document, plus the changes necessary to automatically generate any previous version) and the fact that all of these systems are integrated under a common user interface. This system is a strong addition to any paperless/automated document review and configuration management process.

The additional development required for Phase II is very minimal. A working model will be in place in the MLRS Configuration Management Office (CMO) by the end of July, 1993. Once the working model is in place, ISSI will be receiving feedback from the staff of the MLRS CMO on possible improvements to the interface and recommended additional capabilities.

As CIRS is being used and evaluated by the MLRS CMO, ISSI and TecMasters will be marketing the system to other project offices and directories within MICOM, as well as some NASA/Marshall Space Flight Center (MSFC) project offices and technical laboratories. Specific targets are the Patriot Project Office, the Army TACMS Project Office, the GPALS Project Office, the CALS Office, the Software Engineering Directorate (SED), the Systems Analysis and Integration Laboratory (SAIL, NASA), the Payload Projects Office (NASA), the Mission Operations Laboratory (NASA), and the Propulsions Laboratory (NASA). The system will be demonstrated in each of these offices to the appropriate personnel and, if desired, will be implemented into their current configuration management systems. TecMasters, Inc. will spearhead the effort at MICOM, while ISSI will lead in the marketing to NASA.

## IRI Corporation

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Fax (818) 996-6141

Amir Dan Rubin, Business Development  
Dr. Izhak Rubin, President

IRI is a leading engineering and communications research, development and consulting company engaged in design, analysis and performance evaluation of telecommunication networks and systems.

Planyst<sup>TM</sup> is a breakthrough network planning and analysis tool that utilized Analytical Methods, Sensitivity Studies and Simulation Evaluation, along with Expert Results Interpretations and a friendly Graphical User Interface, to plan and analyze network and traffic service scenarios, and optimally set network parameters.

Planyst's unique Analytical Evaluation analyzes networks in real time. A revolutionary Parameter Selection feature optimally sets FDDI parameters according to user specified requirements. User's can configure FDDI networks with parameters optimized to their own traffic and delay requirements.

Planyst offers an easy to use Graphical User Interface, detailed default scenarios, and intelligent routines that walk the user through the modeling process. Absolutely no programming is involved. Output is clearly viewed in tables, files, and charts. Expert Results Interpretation provides explanatory analysis of output, offering advise and meaningful conclusions.

IRI is also developing Planyst Product Advisor<sup>TM</sup>, a software tool which utilizes a Graphical User Interface to access a database of vendor hubs, bridges, routers, and adapter cards. User's can evaluate price and performance features of networking hardware - comparing such information as: cost, performance, bridging/routing support, module/port/media specifications, backplane architecture and more.

Planyst utilizes standardized terminology and widely recognizable common icon images. A unique and extremely versatile traffic generator allows for modeling of any type of traffic, while maintaining ease of use. A library of pre-modeled default sources is also provided. Planyst's modular design and object oriented programming structure facilitates development of modified and tailor-made versions of Planyst.

IRI's first version of Planyst<sup>TM</sup> Network Planning and Analysis software is close to completion. Sophisticated Analytical Modules and Expert systems used for analyzing various Local Area Networks and optimally selecting Network parameters, as well as modules for analyzing Traffic Sources, Queues, Processors and various OSI Layer Protocols, will be available.

IRI has a dual interest in developing partnerships and strategic alliances:

One: Planyst<sup>TM</sup> Network Planning and Analysis software is virtually completed and is ready to ship. Planyst is truly a breakthrough since it utilizes Analytical techniques, as well as conventional simulation methods, to plan,

analyze and optimally set network parameters. Additionally, Planyst offers an extremely friendly Graphical User Interface, along with Expert Result Interpretations features to develop a practical tool for network administrators. IRI would like a strategic partner to assist in marketing and selling Planyst. Licensing, reselling and various joint arrangements are of interest, as are propositions to tailor Planyst to meet the needs of individual user groups.

Two: IRI intends to proceed with additional follow-on and applied Planyst Developments, expanding the scope of communications systems examined. IRI intends to continue developing sophisticated analytical models which will interact with the existing Graphical User Interface, to analyze various Metropolitan and Wide Area Networks.

Planyst is ideal for analyzing full service, interactive, multimedia networks which will provide homes and businesses with entertainment, financial, communication and shopping services. IRI can apply and leverage its analytical modeling techniques, utilizing its already developed Object-Oriented structures and Graphical User Interface, to tailor versions of Planyst to analyze: Telephone, Cable, Satellite and Cellular Multimedia, Interactive and Mobile networks. Planyst can address such interests as: Assisting vendors design and analyze criteria for new hubs, switches, chip-sets and sophisticated "cable" converters; and helping analyze new service offerings from Telephone (RBOC's, Long Distance), Cable, Satellite and Cellular operators and programming providers.

IRI would like to work with a strategic partner to market Planyst to meet the needs of the various players involved in delivering these full-service interactive, multi-media networks, as well to satisfy the demands of network administrators calling for easy to use, intelligent planning and analysis tools. A strategic partner could bring business development, marketing and sales support, as well as help fund additional developments.

## Iterated Systems, Inc.

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Norcross, GA 30092  
Tel (404) 840-0728  
Fax (404) 840-0029

Alan D. Sloan, President

Iterated Systems, Inc., provides image encoding technology which enables digital systems to store, distribute, and exploit imagery in a resolution independent manner very efficiently. The company is committed to development and commercialization of its fractal encoding technology.

Fractal Encoding Technology has been validated as an enabling technology for digital imaging applications where high performance is required. The technology is available in hardware and software component form. Typical applications involve the efficient storage, distribution, access or analysis of imagery. For example, fractal encoding can result in a high compression ratio which enables the rapid distribution of high resolution imagery over low band-

width communication links. Examination of fractal image codes leads to an automated feature extraction capability.

Additional Development Needed: Custom development to optimize for application specific requirements and constraints offers a path for non-marginal performance improvements and cost reduction.

## KASK LABs

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2659 West Guadalupe Rd., Suite D112  
Mesa, AZ 85213  
Tel (602)-964-6577

Fred O. Kask, Chief Engineer

Company Purpose and Goals: To aid in the use of personal computer systems for use in design, development and knowledge base implementation. The finding of information and data in a well organized manner. Development of software.

The prime objective was to develop a technique that would be able to access and use various types of information and data that has been implemented on a personal computer system. This information and techniques could relate to both engineering and business type development. In the area of engineering, these methods could be used for electronic modeling and simulation. Any type of knowledge could be implemented. The Kask Labs developed navTEXT system is the basis of these techniques. This has been implemented on the Macintosh computer system. The system has been ported to the OS2 and Windows environment of the AT/386 base PCs. This allows for both use of information and the running of various types of computer applications. Another area is in the development of computer programs. This is the organization of code, specification, and performance verification. This allows the user to be master of the computer system; not to be a slave of the computer system.

The end objective is to make computer systems easy to use and be able to solve problems and be helpful in the every day work tasks.

Additional Development: Continue porting to the OS2 and NT 32 bit operation system. The implementation of all types of Knowledge. The automated design of computer software. The organization of developed computer codes.

Kask Labs can provide a shell for the implementation of any type of Knowledge. This information can be used for different things. This would include the design of various types of engineering and business requirements and the organization of software development.

The various companies can use these methods in their environment and can use this in their products. These same methods could be sold to other companies that may have use of this type of information.

Kask Labs has developed a lot of computer programs for use in engineering and electronic design. These techniques have been used for modeling and simulation. All this information is organized in a well defined manner — navTEXT.

Working together we can provide help in the use of computer aided anything. This is of benefit to everyone. Everyone requires and needs knowledge. We can provide this service to all.

## KDC Technology Corp.

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Dr. Donal R. Dunn, CEO  
Dr. Ray J. King, V.P. for R&D  
Dr. Michael Werner, Electrical Engineer  
Mr. Jesse Basuel, Electrical Engineer  
Mr. Ronald Wood, Sr. Technician

KDC exists to be the leader in designing and developing innovative electromagnetic measurement technology for industrial applications.

KDC has recently completed seven Ph I and three Ph II projects sponsored by DoD, DoC, USDA, and NIH. All projects relate to the development of sensors and instruments for continuous, on-line measurement/monitoring of the dielectric and dissipative properties of various industrial materials at microwave frequencies. All use various forms of innovative sensors and two-parameter measurement techniques to quantify material properties such as moisture content, density, thickness, polymer curing reaction, chemical reactions, constituent proportions, porosity, voids, cracks, etc. This is done through interaction of the sensor electromagnetic fields with the bulk dielectric constant, dielectric loss factor, and conductive properties of the test material. Since two independent parameters are measured, two independent physical properties (e.g., moisture content and density) can be determined simultaneously. Both contacting and noncontacting sensing techniques have been developed. Choice of the sensing technique, the sensing frequency and the particular sensor design depends on the nature of the particular product being measured and on the on-line production logistics.

We are now manufacturing and marketing microwave sensors and instruments for several niche applications (see below) but opportunities for additional applications in a dozen or more new niches have presented themselves. These new opportunities are only the tip of the iceberg. To exploit each of them generally requires a brief (1-2 month) developmental study to demonstrate usage and to calibrate the sensors for that particular application.

The targeted markets for our technology are:

- Wood Materials: Continuous, on-line monitoring of moisture content/density of solid dimension wood, wood composites, flakes, chips, fibers, etc.
- Food Products: Continuous, on-line monitoring of moisture content/density of grains (all species), nuts, dried foods, powders, dough, baked goods, dairy products, etc.

- Minerals: Monitoring moisture/density of foundry sand; carbon content/density for fly ash, etc.
- Nondestructive Evaluation: As applied to nonconductive composites, in situ measurement of moisture absorption and desorption, fiber/filler ratio, voids, cracks, porosity; measure electrical and thermal conductance of carbon fibers.
- Polymers: Continuous, on-line or in-mold sensors for monitoring viscosity, cure rate, degree of cure, critical timing features, and porosity of thermoset and thermoplastic polymers. Monitoring the thickness and dielectric constant of thin films.

Our corporate strategy is to set up a new corporation jointly owned by KDC and a synergistic corporate partner. This new corporation would specifically target polymer applications as briefly described above. KDC brings to the table a totally new technology and an embryo manufacturing capability, plus the capability to support further related R&D for special new opportunities. The partner could bring management assistance and capital for setting up the new company and for expanding our manufacturing capability, and the essential marketing capabilities.

## Kinetic Systems

26240 Industrial Blvd.  
Hayward, CA 94545  
Tel (510) 732-1575  
Fax (510) 732-1576

Cormac G. O'Neill, Technical Director  
James H. Barrister, Jr., General Manager

Kinetic Systems fabricates piezoelectric devices employed as motors or generators. The company supplies bare Piezomotors and/or complete systems including power supplies and control subsystems. Kinetic Systems also undertakes R&D in the application and refinement of Piezoelectric devices that have unique requirements relating to rapid response, high force, precision, or controllability.

The prime objective of the Phase II VARVAL program is to demonstrate that a hydraulic system for operating the Inlet and exhaust valves of an engine can be provided that can adjust the timing of the valve opening events, adjust the valve open period and adjust the valve lift by exercising electronic control. In performing these functions, the VARVAL system reduces parasitic power losses by utilizing pressure oil only during the acceleration periods of the opening and closing events. Consequently, not only is the compromise between peak power and peak torque, normally encountered in selecting valve timing events, avoided but the energy expended in performing the valve opening and closing is minimized.

The Phase II program will demonstrate the system in operation on a single cylinder engine.

The system is dependent upon the use of fast response, PZ driven oil flow control valves that are capable of 1/2 ms response from command to full opening.

The benefits to be obtained from such a system are:

- Potential elimination of the throttle on spark ignition engines with consequent reduction in pumping losses - economy gain.
- Reduction in parasitic power loss due to elimination of camshaft drive power - economy gain.
- Reduction in size, weight and complexity of crankcase due to elimination of camshaft, camshaft drive, pushrods, rockers, springs and tappets - economic gain.
- Avoidance of compromise between valve timing for peak power, peak torque, and emissions.
- Early exhaust valve opening for turbine acceleration to avoid turbo lag.
- Cold start improvement - steadies idling.

The system will need further work to incorporate it in a multi-cylinder engine. This effort must include address to cost reduction. The work performed to date has been centered on developing a working system. The next stage is to exploit the capabilities of the system on both diesel and gasoline engines. This work would best be performed by an engine manufacturer.

Implementation Strategy: Kinetic Systems would develop methods of PZ stack fabrication to reduce costs and increase quality and investigate low cost power supplies and control systems, while a Partner would determine optimum modes of usage, select operating features, select settings, and produce engine.

## Linares Management Associates, Inc.

93 West Tech Center  
Medfield, MA 02052  
Tel (508) 359-9680  
Fax (508) 359-9680

Dr. Robert C. Linares, President

The primary goal of LMA, Inc. is to provide the next generation of semiconductor materials (wide band gap semiconductors) on a large scale manufacturing basis as single crystal wafers, films and structures, to the semiconductor and optoelectronic device industries.

Single crystal diamond is an important wide band gap semiconductor which offers the potential for device operation at higher power and speed and under more adverse conditions of temperature, radiation and chemistry than current semiconductors. Diamond also holds promise as a high temperature strain gauge and electron emitter. The current Phase II program addresses two major roadblocks to diamond device development: 1) High cost and small area of free standing single crystal diamond wafers; and 2) poor electronic properties of semiconducting diamond films. The program plan is to improve chem-



istry and reactor design which will lead to 1 cm<sup>2</sup> free standing single crystal diamond wafers during Phase II and 4-5 cm<sup>2</sup> during Phase III. Wafers will be offered for sale during Phase III. The program will also improve the electronic properties of semiconducting diamond through the reduction of impurities, reduced crystallographic defects and optimized device structures. During Phase II FETs will be built and tested at a major device foundry. The program emphasizes the need to establish a low cost process and customer interaction to continually improve the product.

The company currently has strategic alliances with industry and university laboratories in the areas of research and device development. The company seeks additional interactions at the advanced development level to ensure that the transition to manufacturing can be made in a timely and cost effective way. The company is interested in exploring a wide range of options with potential partners. Device development and testing, and evolution of specifications are of particular interest.

### Logis-Tech, Inc.

1800 Diagonal Road, Suite 250  
Alexandria, VA 22314-2840  
Tel (703) 684-7117  
Fax (703) 548-9658

Roland E. Berg, President & CEO  
Gerry K. Sellman, Senior Vice President  
Mark Grubb, Project Manager

Company Purpose and Goals: Center of excellence for state-of-the-art fly/drive away storage programs. Logistics specialists for: ILS; Program Management; RFP bid preparation; productivity enhancements, including environmental; training, including Total Quality Management and automated live-fire scoring; aviation/avionic maintenance/production.

The purpose of the Phase II "Controlled Atmosphere Storage of Naval Aircraft" Technical Evaluation (TE) is to define preservation and storage techniques and level of investment needed to create methods which pace Naval aviation's changing global requirements. This program incorporated lessons learned from past corrosion/protection programs. It addresses available and emerging preservation technology (both foreign and domestic), related maintenance support, costing implications and overall material readiness impact.

Phase II will validate the technical feasibility of applying state-of-the-art advances in Fly Away Storage Technology (FAST), identified in Phase I, by conducting a one-year test on stored AV-8B Harrier aircraft at Marine Corps Air Station, Cherry Point. The TE will use two types of temporary shelters (tension membrane and metal relocatable), desiccant wheel dehumidifiers and drop "shrouds" to achieve and sustain a 30-40% relative humidity aircraft environment. All TE test and control aircraft will be continually monitored by an automated data collection system and inspected on a regular basis for degradation. At the end of the TE, data will be analyzed and a comprehensive re-

port, with quantified results, generated to define an equipment envelope by which FAST can be expected to maintain stored aircraft, engines and components in a cost-effective and rapidly deployable condition

Additional Development Needed: Air distribution system w/5-10 year exterior life; sensors for real time tracking of rust, oxidation, and corrosion in both exterior and interior storage configuration; mobile solar/wind electrification equipment (110/230 VAC); and methodology for integrating into Contracted/Organic Government/Industry Maintenance and overhaul programs

LTi implementation strategy includes teaming arrangements with large logistics services companies. These teaming arrangements would provide turn-key support for military equipment stored in a ready to issue/ready to fly status. Using the LTi developed, low cost process the LTi teaming service partner would provide required on-site personnel to release the military customer of receipt, store, maintain and issue of stored or prepositioned equipment in the US and overseas. LTi would obtain the SBIR Phase III contract. The LTi team portion would include revised and approved processing/deprocessing procedures and the determination and procurement of the appropriate equipment (i.e., relocatable shelters, specific dehumidification items, remote monitoring equipment, sensors and all related procedures).

## Luxtron Corporation

2775 Northwestern Parkway  
Santa Clara, CA 95051  
Tel (408) 727-1600  
Fax (408) 727-1677

Dr. William Hyatt, CEO  
Richard Howard, President  
Dr. Mei Sun, Vice President, R&D  
Russell Bigelow, Program Manager

Company Purpose and Goals: Manufacture of fiber optic and other sensors for applications within medical, IC fabrication, electric power generation and distribution, and other industries.

Luxtron corporation has completed a Phase II SBIR contract with the Naval Surface Warfare Center to develop and test two prototype fiber optic pressure sensors that meet military requirements for shock, vibration, and electromagnetic compatibility and are compatible with fiber optic communications. The sensors achieve a repeatability of 0.02% of full scale and an accuracy of 0.3% over the temperature range of 0 to 65°C. The technical approach can provide sensors with an accuracy of 0.02% of full scale, and a measurement of temperature of the working fluid can be provided. These sensors require no periodic calibration and are insensitive to changes in the optical transmission properties of the optical fibers used to connect them. All fiber optic components used with the sensors are those used in fiber optic communications. The sensor is powered by an LED, which eliminates laser safety concerns and increases the MTTF by two orders of magnitude. Commercial applica-

tions of these sensors include any application for measuring absolute or gauge pressure for which is required explosion proofing, voltage isolation, low electromagnetic emissions, or immunity to environments with high electromagnetic interference.

The additional development required for the pressure sensor is to modify the design to reduce cost. Cost reduction would comprise replacing military fiber optic connectors and receptacles and the optical power cell within the transducer. A second round of prototyping would be required, which would be followed by an effort leading to release of the commercial product for production.

The fiber optic sensor developed for the Navy is one of a family of sensors the design of which has a high degree of commonality. Sensors of this type can be built to measure pressure, temperature, electrical current, voltage, acceleration, and others. These sensors will have an advantage over their electrical counterparts to the extent that the cost of the electrical sensors is increased to provide the inherent attributes of fiber optic sensors; i.e., voltage isolation, explosion proofing, very low electromagnetic emissions, immunity to environments with high electromagnetic interference, and compatibility with fiber optic communications. For example, electrical current transformers for high voltage applications have a cost of \$60,000. A fiber optic sensor of much less cost can replace such a transformer. The cost of electrical pressure sensors used within the petrochemical industry is increased substantially by the need to meet NEMA 7 standards for explosion proofing. The fiber optic pressure sensor built for the Navy can meet NEMA 7 standards with no modification.

In addition to the prototype pressure sensors, prototype electrical current sensors and voltage sensors have been built at Luxtron. The development plan is to find applications for these sensors, build prototypes for alpha-site testing, and release one or more of these sensors to production within the next 24 months.

## Mainstream Engineering Corporation

200 Yellow Place  
Rockledge, FL 32955  
Tel (407) 631-3550  
Fax (407) 631-3552

Dr. Robert P. Scaringe, Thermal/Fluids Research Engineer  
Dr. Fulin Gui, Machine Design, Thermal Science Research Engineer  
Dr. Mohammed M. Rahman, Computational Fluid Dynamics  
Research Engineer  
Mr. L. Grzyll, Chemical Research Engineer  
Mr. K.M. Tai, Composites Research Engineer

**Company Purpose and Goals:** To develop innovative solutions to thermal control problems, composite fabrication problems, energy related problems and environmental issues. To market the hardware that results from this re-

search and product development. Mainstream has a very successful track-record at commercializing both Phase II and Phase I efforts.

Mainstream has developed a compact sliding-vane rotary compressor for use with Non-Ozone-Depleting Refrigerants such as R-134a. This compressor has application in the commercial vapor compressor market.

Mainstream has developed and perfected a chemical/mechanical heat pump which provides improved COP when compared to convention vapor compression heat pumps and this heat pump can utilize Non-Ozone-Depleting working fluids.

Mainstream has developed a computational chemistry screening technique to predict potential new working fluids, lubricants, and Halon Fire Suppressants. The technique has already successfully identified new non-toxic working fluids for NASA and makes the identification of new compounds much faster.

Mainstream has completed an environmentally-safe chemical heater for use in propellant handlers suits (SCAPE suits). This technology has numerous cold weather applications.

Mainstream needs no additional funds for additional development.

Mainstream will license the technology to interested concerns.

## Materials Analysis, Inc.

10338 Miller Road  
Dallas, TX 75238  
Tel (214) 343-3811  
Fax (214) 343-3812

Raymond J. Claxton, President

Materials Analysis, Inc. is an independent consulting firm performing metallurgical and mechanical engineering, testing, and research.

A lightweight multi-metal gear/shaft manufacturing method was developed using inertia welding techniques. A steel outer ring is joined to a titanium alloy web and/or shaft through the use of a suitable interlayer material such as aluminum. Surface hardening of the steel is carried out by conventional gas carburizing pre-machined components prior to welding or by selective hardening the finished product using induction heating or similar process.

Flight quality demonstration gears were successfully manufactured to replace the sun gearshaft in the Allison 250-B17F gearbox. Dynamic stress testing revealed the multi-gear and the conventional all steel gear to be dynamically similar with no vibrational abnormalities anticipated in service. A prototype multi-metal gearshaft was subjected to 150 hours of repeated duty cycles by Allison in a 250-B17F gearbox test cell where it performed without incident.

The prototype gearshaft evaluated in the Allison tests weighed twenty-eight percent less than the incumbent all steel component.

Thrust to weight performance is enhanced when weight is saved in any part of an engine. The current status of the multi-metal composite gear/shaft technology will allow low risk introduction into engine development programs and provide a cost efficient method of improving engine performance.

The technology is ready for direct, immediate implementation. As with any technology, additional development could increase performance and/or broaden the range of applicability of the technology.

The multi-metal gear/shaft technology will find application in products such as aircraft engines, transmissions, or other geared components where weight is a factor in performance.

Materials Analysis and Interface Welding, owners of the technology, are open to consideration of any mechanism by which this lightweight gear manufacturing process can find its way into high technology American products.

## Materials & Electrochemical Research (MER) Corp.

7960 South Kolb Road  
Tucson, AZ 85706  
Tel (602) 574-1980  
Fax (602) 574-1983

Dr. J.C. (Jim) Withers, CEO

**Company Purpose and Goals:** Advanced high technology material including ceramics, reinforcements, intermetallics, coatings, composites, joining and fullerenes "buckyballs." R&D to production of these materials including component hardware.

The core technologies of MER which were developed under several Phase II programs include: Reinforcements (SiC fibers and fabrics, and whiskers), Coated fibers (metal and ceramic coatings), Ceramics (nitride and oxide), Composites (metal, intermetallic and ceramic matrix with fibers and whiskers, and C-C and SiC/SiC), Intermetallic alloy powders in very fine particle size, Joining dissimilar materials (ceramics, C-C, metals, composites, etc.) and Fullerenes (buckyballs, buckytubes, endohedral complexes and custom compounds). Each of these core technologies provide enabling material for a variety of composites including high thermal conductivity electronic packages, ceramics with a compressive layer that produces exceptional strength and toughness, metal matrix composites with up to 80v/o reinforcement for a variety of structural thermal and commodity applications, buckyballs for applications in optics, nucleating diamond, battery electrodes, encapsulated drug delivery, etc. to mention a few. There are exceptional opportunities to apply these unique and advanced materials in materials limiting applications. The materials have been demonstrated on a research basis and are now ready for commercialization in a variety of applications.

The development varies with each material but in general has been fully demonstrated on a research scale. In many cases, only application development to a specific product is required.

MER is quite flexible for development in each materials area. All possibilities are open from licensing, partnerships, strategic alliances, joint ventures, financing for equity, outright sale of the technology, etc. Please contact MER relative to any of these core technologies.

## Matsi, Inc.

430 Tenth St., NW, Suite S-007  
Allanta, GA 30318  
Tel (404) 876-8009  
Fax (404) 876-8203

Glenn Woodruff, President  
Ron Pull, Vice President

**Company Purpose and Goals:** Develop and commercialize high performance battery products based on zinc and oxygen electrochemistry.

The project goal is to develop a sealed, rechargeable zinc oxygen battery with a specific energy of 285 Wh/kg. This is equal to 7 times the specific energy of nickel-cadmium, 5 times that of nickel-metal hydride batteries, and 3.5 times that of the recently introduced Sony lithium-ion battery. The design uses a stack of alternating zinc and oxygen electrodes in a cylindrical stainless steel can. The oxygen produced during charge is contained at up to 100 atm of pressure within the can. This is analogous to hydrogen containment in nickel-hydrogen cells. The program will result in the production and delivery of thirty cylindrical 15 Ah batteries.

The Phase I program demonstrated the feasibility of the cell, with half-cell tests resulting in 150 cycles for the zinc electrode and 350 cycles for the oxygen electrode, as well as full scale cell tests demonstrating 50 cycles of steady performance for the zinc-oxygen couple.

Potential applications include portable electronic and electrical products, such as 2-way radios, cellular telephones, medical telemetry, instruments and test equipment, audio and video tape equipment, portable power tools, portable computers, and oceanographic and meteorological equipment.

**Additional Development Needed:** In-depth market analysis of potential military and civilian applications, followed by a complete manufacturing engineering a production effort.

We are open to any reasonable suggestions, but would prefer to maintain a role as a research and development resource.

## Merra RD&C, BDC

2901 Hubbard Road, B-106  
Ann Arbor, MI 48105-2000  
Tel (313) 930-0033  
Fax (313) 930-0145

Mark Clevey, Vice President  
Roberta (Bobbi) Blake, Executive Business Counselor

Michigan - State SBIR Support Program "Winners" initiative - Focus on commercialization options for SBIR winners: Investment, strategic alliances, license, procurement, bootstrap.

## Merritt Systems Inc.

P.O. Box 2103  
Merritt Island, FL 32954  
Tel (407) 452-7828  
Fax (407) 452-7828

Mr. Douglas Rosinski, President  
Dr. Daniel Wegerif, Vice President  
Mr. William Parton, Investigator  
Mr. David Olds, Engineer

MSI develops whole-arm proximity sensing technology for kinematically redundant robot manipulators. This technology includes proximity sensing hardware, robot control software, and employment techniques. Our goal is to produce a commercial obstacle detection and collision avoidance system for use on new and existing manipulators performing high value tasks in constrained or hazardous environments.

MSI developed a generic system to protect the entire periphery of a robot manipulator from collisions with objects within the work envelope. This capability enables robots to enter dynamic or constrained environments with little or no a-priori knowledge and successfully complete high value tasks. It is particularly well suited for robots operating near expensive flight hardware, in hazardous environments or for applications where robots are working near or with humans. The system utilizes sensorCells which incorporate discrete proximity sensors, a distributed processing system and a communication scheme to support real-time object detection. This arrangement supports a variety of sensing media including infrared, acoustical and capacitive. The current I/R implementation provides a sensing range of 0.5 meter and over 1000 sensor measurements per second.

Our current version of the sensorCell uses discrete components. MSI is planning to incorporate surface mount components in the near future. We are investigating the use of Application Specific Integrated Circuits (ASICs) to reduce the physical size and increase reliability. We require additional development in mechanical mounting design and sensor packaging.

MSI is interested in discussing a strategic alliance or joint venture with an established electronics or robotics manufacturing firm. As a small concern, we recognize the need to ally ourselves with a larger, more experienced firm to effectively market our system. We foresee several options for such an arrangement.

MSI is willing to directly license our technology for further development, production and marketing. MSI could provide continuing technical support under such an arrangement, if desired.

A strategic alliance between MSI and a robot manufacturer is also of interest to us. Our generic control software and flexible hardware design lends itself to integration with a wide range of devices. Our system could be offered as an option for new robots and as a retrofit to current users. Under such an ar-

angement, MSI could provide design information, while our partner manufactures and markets the product

### Metratek, Inc.

12330 Pinecrest Road  
Reston, VA 22091  
Tel (703) 620-9500  
Fax (703) 620-9696

Raymond Harris, President  
Robert Mauer, Business Manager  
Donald Maffei, Program Manager

METRATEK, the "We innovate for you" company, is inventing America's future as a micro-aerospace company that accomplishes major systems developments with small teams of dedicated professionals

### Micro-Optics Technologies Inc.

8608 University Green #5  
Middleton, WI 53562-0377  
Tel (608) 831-0655  
Fax (608) 831-5821

James P. Stec, Vice President  
Larry A. Gunseor, Senior Project Engineer

Micro-Optics Technologies, Inc., Manufactures and markets fiber optic microphones, fiber optic low pressure sensors and liquid crystal light valves for military and civilian markets. To develop new products based on electro-optic technology that use light for communication and image processing

A Fiber Optic Microphone (FOM) has been developed under an Air Force Phase II Small Business Innovation Research contract in cooperation with Armstrong Laboratory at Wright-Patterson Air Force Base.

The fiber optic microphone converts acoustic signals directly to an intensity modulated light signal which is transmitted over fiber optic cables. It can also be used as a low pressure sensor at infrasonic through acoustic frequencies. This microphone is immune to the electromagnetic interference and pulses that interfere with the operation of a conventional electric microphone. The transducer of the fiber optic microphone generates no electrical signal making it safe to use in explosive or otherwise hostile environments. A FOM can be constructed of non-metallic materials for use in areas with high magnetic fields or where metallic components are not desirable.

The opto-electronic components of the system can be located up to several kilometers away from where the microphone is being used with no degradation of the signal. Several different FOMs can be multiplexed over the same fiber optic trunk line offering space and weight savings over copper.



Further development is needed to enhance the frequency response of the fiber optic microphone for other than voice communication and in packaging for non-aviation markets.

Micro-Optics Technologies intends to manufacture and market fiber optic microphones and low pressure acoustic sensors to military and commercial markets. The company is also currently selling liquid crystal spatial light modulators and liquid crystal shutters.

The expertise of the individuals in the company lies in the area of electro-optic technology. We are looking for individuals or companies who could contribute knowledge and funding in the acoustic development of the fiber optic microphone and sensors and use already established distribution channels to market the above products. Any relationship would include cooperative efforts to identify areas where the products currently held by Micro-Optics Technology could be utilized. We also intend for this cooperation to extend to the identification and development of needed products based on this technology.

### Microtronics Associates, Inc.

3337 Forbes Avenue  
Pittsburgh, PA 15213  
Tel (412) 681-0888  
Fax (412) 681-0591

Dr. Victoria T. Coon, President

Microtronics Associates is involved with research and development work on semiconductor electronic devices, ionizing radiation detectors, infrared detectors, electronic instrumentation and associated software. Most of Microtronics Associates' work is done under contracts from federal government agencies. Electronic instrumentation involves CAMAC and IEEE-488 data acquisition and control modules interfaced to microcomputers. Electronic device applications include adaptive neural networks, and semiconductor doped material for optical electronics.

### Miranda Laboratories

74 Loomis Street  
Bedford, MA 01730  
Tel (617) 275-1150

Henry A. Miranda, Jr., Sole Proprietor

Miranda Laboratories specializes in one-of-a-kind instrumentation development, for highly specialized purposes. The willingness to couple with larger organizations having the capacity to interface with the commercial/space marketplace has been and remains a goal.

A spaceborne sizing spectrometer for single-particle spacecraft environmental monitoring and/or research was developed under NASA GSFC spon-

sorship. This generates a size distribution histogram of particles crossing a remote sensing zone, (in the 5-50  $\mu\text{m}$  regime), without having to know their shape or their refractive index. The Ph-II configuration was designed to fit within two adjacent gas canisters. However, these dimensions can be scaled either up or down to emphasize other requirements that may be preferable (for example, a larger sensing zone, or instead a smaller package).

The technology is readily transferable to other uses, (either in industrial vacuum deposition/ion implantation equipment, or in space), by trading off certain output parameters in favor of others. For example, if specific sizing information were to be relinquished, then flow-field information (for particles larger than some threshold size) can be derived for a large-area remote sensing zone. For industrial applications, the point of origin of 0.3  $\mu\text{m}$  particles falling on a 9-inch wafer can be determined in situ, while deposition/implantation is in process.

The high-risk portion of the development program is completed. It now remains to undertake the low-risk effort, (which could include the marketing required to identify the current needs of spaceborne monitoring and/or research). For vacuum technology applications, Miranda Laboratories can produce a working prototype particulate monitor using its present expertise, with equally low risk.

Miranda Laboratories is interested in transferring its proprietary information, together with all associated expertise, to a larger commercial entity having the resources to engage in the requisite low-risk development effort leading to commercial exploitation of the subject technology, with royalty payment downstream. Miranda Laboratories is prepared either to be actively engaged in the early stages of such final development, or alternatively to act in an advisory capacity with appropriate compensation to be worked out under a mutually satisfactory agreement.

## Modeling & Computing Services (M&CS)

39675 Cedar Blvd., Suite 290  
Newark, CA 94560  
Tel (510) 226-1183  
Fax (510) 226-1073

Ernest D. Eason, Ph.D., Principal

M&CS develops specialized software for engineering design and analysis and applies such tools as consultants to industry, research institutes, and government agencies.

Software is being developed to enhance engineering design productivity on Multi-disciplinary problems such as integrated electronics and mechanical design, vehicle design, aviation and aerospace systems, offshore structures, military systems, and power production and distribution systems. Unlike approaches which integrate a specific set of analysis codes in a new super-code, our approach features a coordinating module and analysis modules that link to the input and output routines of existing, unmodified analysis codes. The approach is quite general, and can be applied to any network of

analysis tasks, running concurrently on different computers. With our software, the work can be divided into manageable analysis tasks that reflect the project and company organizational structure. Each task leader is free to choose the best analysis approach for the current level of design definition in his or her task. The coordinating module and the analysis modules work together to implement a sophisticated system design optimization strategy, so that the overall network of analysis tasks will iterate toward a solution that satisfies all constraints and optimizes system design goals such as minimum cost for a specified level of performance.

Summarizing the key features, the software: Facilitates dividing system design problems into a network of coupled analysis tasks; works with system problems of any structure or form, in any combination of disciplines; uses any set of analysis tools, which can be running concurrently on multiple computers; and guides the project team toward optimal system designs meeting all defined constraints.

The emphasis in Phase II is on technology development, because the underlying algorithms are still evolving. Phase III development will be needed to produce a polished, commercial software product from the Phase II development code. However, the technology can be added to internal design tools at various organizations at the end of Phase II (6/94) or possibly even sooner.

M&CS is interested in two basic Phase III implementation paths: 1) Developing a commercial software product, and 2) consulting with industry and government agencies to build the technology into their existing internal design and analysis tools. In the first area, venture capital and cooperation with established engineering analysis software vendors are sought. Specific forms of cooperation will be discussed in one-on-one meetings. In the second area, contracts with private companies and government agencies are sought.

## Morlock Environmental, Inc.

23 Pine St.  
Lebanon, NH 03766  
Tel (603) 448-4420  
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Clayton Morlock, P.E., President / Principal Engineer  
John Jemsek, Ph.D., Vice President / Principal Scientist

Morlock Environmental is a small firm which performs research and applied engineering to find new efficient means of monitoring the subsurface environment. We develop turn key systems for long term monitoring at hazardous waste sites and for rapid remedial investigations.

There is a need for better methodologies to monitor remedial action effectiveness. Long term monitoring of remedial actions should provide a means to evaluate effectiveness of the remedial system in place, not just comply with regulations. It should provide information on how to improve the system and feedback on how to optimize day to day performance given changing conditions in the ground. Current monitoring methods which rely on conventional

ground water sample and analysis do not provide enough information to optimize a remedial system. Furthermore, field samples which are brought to a laboratory often sit for days before being analyzed. Delays in sample analysis raise serious questions regarding sample integrity and the conclusions drawn from results of those samples.

This paper describes a system under development for long term monitoring of remedial action for volatile organic compounds (VOCs) using continuous in-situ monitoring techniques. The system is being tested in research, sponsored by the Air Force. The study encompasses all aspects of continuous in-situ monitoring including: Installation of sensors and sample collection point, how installation affects measurements, sensor and hardware choices, hardware integration, and data management. The system is design to provide continuous information at a remedial action site on VOC concentration soil gas and ground water as well as other environmental parameters such as pressure, temperature and depth to ground water. Analysis and data archival is performed using a geographic information system. Continuous data from the sensors, combined with frequent GC analysis, provides sufficient information to demonstrate trends, significant events, etc., which can be used to optimize the remedial system.

We are looking for two additional sites for which we can install our system and closely observe its functionality before we start a major marketing campaign.

We are looking for partners who build remedial equipment, or data logging systems for which we can integrate our sensors, and custom hardware/software. We are interested in joint marketing arrangements with companies that make complimentary equipment.

## MTL Systems, Inc.

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Fax (513) 426-8301

Arnold Fife, Sr., President  
Dr. John Little, Vice President of Operations  
Robert Bissell, Director, Business Development  
Raymond Wabler, Director, Strategic Programs/Plans  
Herbert Hirsch, Director, Advanced Technology Program

MTL Systems, Inc., is a 100% employee owned corporation whose mission is to provide government and industry with high quality engineering, engineering services and electronic products which have application for imaging technologies, electronic warfare systems (analysis and simulation), computer based data acquisition systems and video instrumentation.

Of MTL's nine Phase I SBIR awards, two are in Phase II, notice has been received of intent to award three additional Phase II programs and a sixth proposal is being evaluated. The Phase II programs being performed are: Multi-

Threat Engagement Simulator (MTES), and Rapid Flight Line Detection of Degraded Electronic Cockpit Instruments (CODES)

**MTES.** The objective of the MTES Phase II effort is to design, implement, test, and validate a system capable of simulating medium fidelity threat countermeasure (CM) interaction, missile flyouts and platform dynamics involving up to 500 simulated players at a maximum update rate of 100Hz. Commercial use will include similar application by government contractors, and use as a general purpose, high-speed distributed processing system with associated development and testing tools for application to specific commercial programs.

**CODES.** The objective of the CODES Phase II encompasses the design, construction, test, and evaluation of a system for detection of gradual degradation in electronic cockpit displays. The concept includes a portable unit for quick assessment of cockpit displays while in the aircraft and a second unit capable of performing comprehensive analysis of displays in the shop. All industries utilizing electronic displays can benefit from this technology.

At the conclusion of the MTES program, the core high-speed distributed processing software development will be completed such that it can be used on other applications with slight user-specific development.

At the conclusion of the CODES development, the functional design of both units will have been developed and tested. A final production design will then be required.

The MTES software lends itself well to developing strategic alliances with partners who possess existing simulations which would benefit from performance speed-up to achieve real time performance. The structure will be modular to encourage the development of shells around existing modules to run the functions in real time. This allows eventual customers to achieve real-time performance with minimal upgrade expense.

The commercial implementation of CODES will be dependent on the results of the marketing analysis to be completed over the next year. The intent is to develop partnerships with companies who have products complementary to this technology. MTL is interested in continuing the overall development of the product with limited production for niche markets. The partners will be required to make minimal investment and will be responsible for large scale production and marketing support.

## Nanoptics, Inc.

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Dr. James K. Walker, President, CEO  
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Dr. Won Choi, Director of X-ray  
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Nanoptics, Inc. will focus on the use of its fiber technology to develop quality products that are primarily used for improvements in advanced medical and nondestructive examination imaging. These products will be offered at costs that are competitive to existing systems.

Nanoptics is developing a real-time, high-resolution slot scanning, digital imaging system. The system will be suitable for use in a variety of nondestructive inspection applications ranging from security systems to process quality control applications. A more sensitive version of the imager will also be suitable for medical applications.

The principal advantages of the system lie in its superior resolution (up to 15 lp/mm) and its high detective quantum efficiency, corresponding to minimal required radiation exposure.

A full-scale prototype system is being designed at this time and should be completed and tested by December 1993.

Nanoptics, Inc., is planning to construct and sell imaging systems, including the x-ray detection device and data acquisition system. These subsystems will be sold to companies to incorporate into their specific NDI/medical application systems. Nanoptics, Inc., will function as a subcontractor in these relationships. Other business relationships are also possible.

## Nathan B. Cummings Foundation

Founder of Sarah Lee

## Network Dynamics, Inc.

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Rajan Suri, President  
Y.C. Ho, Chairman of the Board  
Gregory Diehl, Director of Product Engineering  
Michael Tomsicek, Manager, Midwest Operations

NDI offers advanced factory management software that enables manufacturing managers to cut lead time, minimize work-in-progress inventory, identify and resolve bottlenecks, and optimize labor and equipment utilization, all in the space of a few hours, and without the need for programming or other special computer skills. Together, these small but frequent improvements to production and operations help the manufacturer achieve a time-based competitive advantage over its peers.

NDI's software, utilizing rapid modeling technology (RMT) is based on the proven theory of queuing networks and reliability modeling. With MPX™, factory management decisions that previously required weeks or even months of active support from an OR/MIS team can be settled in under a day directly by the end user/decision maker.

MPX<sup>TM</sup> and its related RMT software enable management to rigorously explore many alternative production scenarios, pose a multiplicity of what-if queries and develop rapid, incisive responses, all in the space of an hour or two. This enables manufacturing enterprises to keep their production lines at the leading edge, no matter what changes ensue from Marketing (e.g., new accounts captured), Finance (less capital budget allowed for new equipment), Manufacturing (Just-In-Time decreed by management), Personnel (overtime reduced), or Strategic Planning (high volume, low margin strategy to be pursued).

Further, the software provides an easy-to-use "bridge" for communications between the islands of information within the manufacturing enterprise — in particular between manufacturing and corporate planning, marketing, product engineering, capital and operations budgeting.

Product functionality will expand at a measured pace to preserve and strengthen NDI's competitive position as the leading supplier of rapid modeling software for continuous improvement in manufacturing.

Variants of MPX can be developed for applications such as air traffic control computers/telecommunications, back offices of banks, brokerages, insurance firms, and other discrete manufacturing analogs.

NDI will evolve its core products increasingly toward integration with MRP, CAD/CAM, Scheduling, Simulation and other decision support tools that are widely used in operational and strategic factory management. Some NDI products are already linked to spreadsheets and simulation/animation software, and discussions are underway for the incorporation of NDI's RMT features into MRP products. Distribution will be expanded through product bundling and other licensing arrangements.

Vendors we have approached feel our products would provide them with a clear advantage over their competitors and deliver high perceived value added to their customers. We are looking to formalize partnerships where the MRP, CAD/CAM, or other partner acts as the OEM and sells integrated software to their current and future clients.

Another avenue of cooperation is with companies that provide equipment or services to manufacturers. The tools developed by NDI enable consultants, computer and factory systems integrators, and sophisticated machining system manufacturers to demonstrate the value of their services and equipment within a client's factory. A trained sales engineer could spend a day or two with the client gathering information and building a model of the current system. The salesperson can then clearly illustrate the value of their products in reduced work load, scrap, lead time and work in process.

Finally, aggressive promotion of RMT concepts will establish MPX as the de facto industry standard. Broad popularization of this manufacturing decision making tool in academia, accompanied by easy-to-adopt course materials, will secure not only powerful opinion leaders among the professional ranks, but also a whole new generation of industry-bound students. NDI has secured a strong foothold in this market with an installed base of over 125 major university business school and engineering departments world-wide.

## New Horizons Diagnostics Corporation

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Larry Loomis, President  
Dave Bernstein, Executive Vice President R&D  
Dave Miller, Vice President Instrumentation R&D  
Dave Trudil, Vice President

New Horizons Diagnostics Corp (NHD) is a privately held manufacture and developer of products for the medical diagnostic, environmental and food testing markets. The Company has focused on R&D and FDA approval of ultra sensitive "two-step" tests utilizing monoclonal and polyclonal antibody technology with various new unique immunoassay formats.

This is a device which can detect multiple analytes (8 or more) from a single sample or conversely can detect a single sample or conversely can detect a single analyte from multiple samples. It consists of a multi-pronged inoculator head each prong of which can either be individually inoculated (in the case of the detection of the same analyte on a multiple of samples) or simultaneously inoculated (in the case of the detection of multiple analytes from a single sample). Each inoculated prong makes contact with a chromophore labeled ab coated disc which is in turn hydrated by the contents of the inoculated prong and which in turn makes contact with a lower chamber which houses individual capture membranes coated with specific antibodies. The lower chamber is removed and can either be read visually or by a battery operated reader which is the size of a pocket calculator. The device is both flexible and versatile and is 2 x 3 inches. The antibody coated discs provides for the rapid interchanging of reagents so that various panels can be customized, has excellent storage and stability characteristics. The analytical sensitivity is in the low monogram range and test results can be obtained within five minutes. This system is easily transportable and can easily be utilized in the field additionally. This technology has the potential of replacing many tests now performed by standard enzyme immunoassay techniques.

**Additional Development Needed:** Extended field evaluation of the working system and identification and preparation of specific panels for detection of various analytes.

The multianalyte system, due to its ease of use and exquisite sensitivity, would have application for food, environmental or medical diagnostics test systems. The automated feature further enhances the potential benefits which can be obtained in either a field or laboratory environment.

In this regard, New Horizons Diagnostics plans to contact the major corporations in the fields of medical diagnostics, food, or environmental testing.

The proposals will be either: Joint Development/Joint Marketing; NHD Development/Joint Marketing; or NHD Development/Corporate Partner Marketing.



## Nielsen Engineering and Research

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Dr. Robert Childs, Exec. Vice President  
Dr. Michael Mendenhall, Vice President  
Dr. Patrick Reisenhel, Chief Scientist  
Dr. Laurence Keele, Senior Research Scientist

The company's purpose is to perform basic and applied fluid dynamics research that leads to the development of technology, software and consulting expertise in the areas of turbulence, missile aerodynamics and expert system aided technology transfer, for sale to industry and government.

Nielsen Engineering and Research has demonstrated the possibility of 50-60% drag reductions on aircraft, and within oil and gas pipelines, using active control techniques derived from chaos theory. Turbulent skin friction substantially penalizes the performance and economics of both these configurations. It potentially affects the performance of any manufacturing process that employs long piping runs or fluid flows that are unstable. In particular, it has been estimated that aircraft operating costs/mile could drop 40% if the flow around aircraft could be made smooth. Two control techniques have been tested at NEAR using numerical simulations of channel and boundary layer flows, and the possibility of 50-60% drag reductions demonstrated. Both control methods are active, and attempt to make use of desirable (low-drag), but unstable, behavior latent within the flow. Control energy expenditures are low, the drag reductions achieved to date requiring less than .1% of the energy of the flow being controlled.

The immediate use for this technology is in drag reduction on aircraft and within pipelines and turbomachinery. Potentially it has applications in the petroleum processing industry as well as in coating applications that employ film flows.

Subsidiary issues still to be dealt within the Phase II include developing actuator designs, a prediction method for the number and density of control elements needed on a surface to maintain control practically, and techniques for flow state identification and feedback using sensors located only at the wall.

Through consulting agreements, NEAR is interested in providing hardware and software design guidance for systems employing these techniques. It is also interested in licensing any actuator technology that ultimately results from NEAR's research.

## Nonvolatile Electronics, Inc.

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James M. Daughton, President

**Company Purpose and Goals:** Develop a nonvolatile magnetoresistive memory technology and license/produce in partnership with large U.S. semiconductor companies. Also, develop and produce niche memory and sensor products.

Magnetoresistive Random Access Memory (MRAM) and magneto-resistive field sensors both benefit from Giant Magnetoresistive Ratio (GMR) materials. MRAM is a nonvolatile magnetic memory technology using magnetic materials for storing data and using magnetoresistance for reading data. MRAMs operate with fast and unlimited writes without a battery or refresh and should be at least as dense as semiconductor alternatives. GMR materials, which have approximately ten times the magnetoresistance of conventional materials currently being used, improve read access times of MRAM to speeds competitive with semiconductor memory. GMR materials can also be used for low cost magnetic field sensors and read heads. Nonvolatile Electronics has been selected for 4 SBIR Phase II (NASA, NSF, and two SDIO) awards, 8 SBIR Phase I awards, and an ATP for developing MRAM and GMR technologies. NVE is a leader in GMR materials fabrication, testing, and applications. NVE has demonstrated working MRAM cells using GMR materials, and has designed a one megabit MRAM suitable as a stand-alone component or for wafer-scale integration. NVE is working on GMR materials with improved magnetoresistance on saturation fields, and is developing MRAM cells using lithography below 0.1 micron. NVE has excellent intellectual property in these areas.

MRAM production requires exercise of the process in a large I.C. line to demonstrate producibility. GMR materials are usable now, but improvements are being developed in magnetoresistance and saturation field.

NVE's mainstream memory strategy is to sell licenses and/or team with major semiconductor memory producers who have the capital equipment, facilities, and disciplines to manufacture and distribute MRAMs.

NVE's niche memory and sensor strategy is to produce and distribute products ourselves, but we seek strategic alliances for packaging and distribution.

NVE's read head strategy is to license U.S. head manufacturers for using our patents and trade secrets in GMR materials.

## Optisensors, Inc.

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Dr. John Farah, President

Optisensors does research and development of innovative fiber optic and integrated optic sensing techniques and systems. We specialize in displacement sensors for the measurement of acceleration, vibration, angular displacement, and acoustic pressure. Our goal is to develop and to commercialize technology by licensing and joint venture.

The concept of an interferometric fiber optic accelerometer with 84dB dynamic range was demonstrated. The goal of Phase II is to build an integrated optic accelerometer on silicon. The fabrication combines thin film passive waveguide (CVD) and silicon micromachining technologies. Advantages of integrated optic accelerometer are compactness, high accuracy ruggedness and monolithic design. It incorporates closed loop feedback and laser diode frequency stabilization as well a thermal drift compensation to extend dynamic range. This accelerometer would be of special benefit to the aerospace industry for use in inertial navigation. It would also be particularly useful to the electric utilities and nuclear power industries for the monitoring of vibration in heavy transformers under adverse heat or electromagnetic interference conditions. It would also be useful for the measurement of strong earth motion in seismology.

Another project concerns the measurement of angular displacement in planar thin film waveguides with very high angular resolution. This has applications in integrated-optic laser beam steering devices and in the measurement of rotation. A third project deals with an integrated optic Fabry-Perot optical spectrum analyzer. Another project deals with interferometer signal processing which allows the measurement of absolute optical path length difference and initialization of servo feedback circuitry in conjunction with coherent light sources.

Phase III investment would be needed in order to complete development of sensors.

We are interested in collaborative R&D during Phase III in conjunction with licensing agreement.

### Opto-Knowledge Systems, Inc. (OKSI)

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Nahum Gat, Ph.D., President

OKSI was founded to take advantage of a unique combination of new technologies in Electro-Optical (EO) sensors and Real-Time Intelligent Systems (RTIS). Our technical objective is to develop technologies, utilizing government and privately funded R&D, which can improve the present generation of instruments for both military and commercial applications. The company goal

is to develop products using patented technologies in EO and RTIS and develop strategic partnerships to bring these products to market.

The project is concerned with the development of an "intelligent hyperspectral sensor" that operates in the visible to infrared portion of the electromagnetic spectrum. The passive sensor acquires spectral signatures that are analyzed under the control of a real-time, asynchronous, interrupt-driven expert system. The control system utilizes a databank library of templates of characteristic spectra that are used by an arsenal of hyperspectral algorithms for the identification and discrimination of the sources under observation. The control system is designed to operate under poor signal-to-noise conditions with high background clutter.

The technology includes imaging spectroscopy, visible and infrared staring focal plane arrays, real-time expert systems, and the extraction of and digital processing techniques of signals.

The application is developed for military target detection. But OKSI is pursuing several other applications: 1) In conjunction with an active sensor, the technique is considered in medical photodiagnosis for in-vivo detection of cancer and other pathologies, in particular during surgery; 2) the capability of various analytical laboratory spectroscopic instruments (e.g., FTIR, GC, MS) can be dramatically enhanced by the intelligent signal processing algorithms; 3) the sensitivity and scope of remote sensing of pollutants in the atmosphere, illicit drugs, and earth and ocean resources can be expanded utilizing the present techniques.

Both sensor and algorithms are developed under the Phase II SBIR for the defense application. The tailoring to a specific commercial application, including the development of the template databank, is necessary.

OKSI is looking for a strategic alliance with companies that are experienced in the specific area of application, having marketing and distribution networks. The interested company will participate in the development of the application and will take the lead during the production and marketing stage.

### Optron Systems, Inc.

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Cardinal Warde, President  
James E. Hubbard, Jr., Vice President

Our goal is to become the leading manufacturer of large-screen, high-definition projection displays in the World.

The high definition membrane mirror projector system is a flickerless, high-brightness, large-screen projection display system that is intended for use in teleconferencing, conference rooms, entertainment centers, training centers, auditoriums and classrooms, film-less cinemas, flight simulators, command control and communications displays, map display, and HDTV. The system consists of three membrane mirror light valves (red, green, and blue), a com-

puter-driven electronics control unit, and the readout and projection optical system. The system is designed to offer a 2000 on-screen lumens, a contrast ratio of 500:1, a 60 Hz frame rate and 1024 x 1280 pixels. The membrane mirror projector employs an electron gun that addresses a proprietary charge transfer plate (CTP) which forms the substrate for the flexible mirror. The substrate contains a high-density array of shallow wells and the electrostatic forces arising from the charge on the CTP deforms the membrane into the wells. Collimated readout light from a high-intensity lamp is phase modulated as it reflects from the membrane, and projected onto the screen to form a large, high-brightness, high-contrast image.

A prototype of the system is currently under development and should be ready for inspection in twelve months. Additional development to improve brightness, spatial uniformity and sharpness may be necessary after this period.

The plan is to establish a wholly-owned subsidiary which will be responsible for the manufacture of this product. To manufacture and market the product, we are seeking strategic alliance or joint ventures with larger companies that bring either manufacturing capabilities and/or marketing strengths.

The spin-off will most likely provide the expertise and be responsible for the manufacture of the anode assemblies of the membrane mirror light valve, while the partner would be responsible for manufacturing the electronics, the complete system integration and marketing. Of course, other scenarios are possible depending on what the partner brings to the table.

## ORINCON Corporation

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Daniel L. Alspach, President/CEO  
Vivek Samant, Chief Scientist  
Otis Benton, Chief Financial Officer

ORINCON is a research and development company that supports government and industry in meeting the challenging demands of advanced technical problems. Our work focuses on support of public and private sector programs in artificial intelligence; software development; communications & navigation; and tracking, detection, and targeting systems.

ORINCON, as an awardee of several Phase II SBIR projects, has developed significant capabilities in the following technology areas: Signal and Image Processing; Expert Systems; Neural Net Processing; Estimation, Guidance, and Control of dynamic systems. These advances have been applied to specific problems of potential significance to both the military and the commercial sector. The Parameter and Attribute Phase II effort sponsored by NAVSEA has resulted in development and application of an augmented transition network expert system shell to a surveillance related target characterization and

tracking system using both quantitative and qualitative sensor information. A second project funded by NAVSEA has resulted in advanced guidance algorithms used against smart and agile targets. A project for the Department of Energy applies neural net algorithms to characterize temperature profiles for Tokamak fusion reactors. A basic algorithm development project supported by ARPA has resulted in new techniques for fusion of information from different feature extractors for the purpose of classification of objects. The technology developed here has been successfully applied to machinery fault diagnosis, medical diagnosis, control of robotic devices, and control of flexible structures to reduce effects of unwanted forces.

The technology base that applies the latest in AI, neural nets, and signal processing to commercial problems has been implemented on state-of-the-art parallel processors. A need exists to transfer this technology in the form of an intelligent processing agent applicable to a wide variety of applications. Although the processors developed by ORINCON perform awesome computational tasks in real time, they are expensive for application in the everyday commercial marketplace. There is a need to develop an affordable and compact processing platform that would make this processing technology available to products used in the medical, maintenance, airlines, building, and manufacturing communities.

The implementation strategies will have to be tailored to the individual research efforts because of their widely differing applications. In general, ORINCON would be interested in licensing agreements with large prime contractors, but we are very willing to consider other arrangements.

## Oval Window Audio

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Norman Lederman, Director R&D  
Paula Hendricks, Educational Director

Oval Window Audio is committed to developing new technologies that increase communication accessibility for the 28 million deaf and hard of hearing people in this country in accordance with the Americans with Disabilities Act. Our assistive listening systems are widely used in public buildings. Our goal is to expand applications to include the transportation industry including motor vehicles, boats, ships, and airplanes.

There are an estimated 28 million deaf and hard of hearing people in the USA. The noisy acoustic environments found in many public areas (e.g., theatres, classrooms, automobiles, buses, airplanes and ships) tend to be hostile listening environments for hard of hearing people. The typical hearing aid worn by millions of people amplifies sound indiscriminately, often rendering spoken communications unintelligible to the hard of hearing person. Our technology bypasses the noisy environment and transmits the desired sound (e.g., the driver's voice in a tour bus situation) directly to hearing aids by way

of magnetic induction. Unlike other forms of assistive listening technology that require special receiving equipment, 30%+ of hearing aids are already capable of receiving the signal from our system. Low cost receivers are also available. Our technology was designed to fulfill the intent and requirements of the Americans with Disabilities Act which ensures that no American will be discriminated against due to physical disability at work, at school or in social situations.

To develop applications for this technology in the transportation industry we will require high profile test sites and technical support pertaining to vehicle electrical systems.

In addition to complying with the Americans with Disabilities Act and assisting millions of hard of hearing people, the inclusion of assistive listening technology in vehicles would make good business sense for many commercial users of certain vehicles. For example, tour bus companies would be able to market their services to a segment of society that has been largely ignored. Airlines companies would be able to promote their flights as safer and more enjoyable for people who cannot hear well.

We are particularly interested in applying our assistive listening technology to the transportation industry (including the airline and boat/shipping industries), first working with manufacturers to create an assistive listening system vehicle option, then developing a strategy for marketing the systems to their customer.

Oval Window Audio has been manufacturing assistive listening technology for use in buildings since 1984. Expanding the applications of this technology to land, sea and air vehicles would be a commercially viable and socially responsible use of our SBIR supported research and development. Our expertise includes audio engineering, audiology and educational program development.

## Pacific Advanced Technology

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Michele Hinnrichs, President  
Robert Hinnrichs, CFO  
Sue Spahr Hodges, Secretary

Established in the Fall of 1988 to address technology needs of government agencies and private enterprise in the areas of electronics and electro-optic sensor technology, PAT has established an outstanding reputation for high quality work in problems associated with advanced technology in infrared sensors and real time image processing.

A new and innovative approach for imaging spectrometry, Image Multi-Spectral Sensing, IMSS, that was recently invented by Pacific Advanced Technology and developed under contract to the Air Force Phillips Laboratory Kirt-

land Air Force Base for application in missile and aircraft surveillance, under a Phase II SBIR is presented in this paper. The IMSS imaging spectrometer can measure spatial, spectral and temporal information on targets such as missiles, aircraft and countermeasures buried in deep clutter. The detector is a conventional infrared staring focal plane array. The dispersive function is performed by a single diffraction lens which focuses a narrow spectral band on the detector array. The spectrum of missiles, aircraft and counter measure devices are quite distinct and different from background spectrum, using the IMSS system the spectrum of these targets can easily be detected.

IMSS has application for remote sensing of auto exhaust emissions and factory pollution emission, for aircraft collision avoidance applications, monitor earth resources and in medical diagnostics as well as defense related applications in the area of missile warning, missile seekers and surveillance applications. This approach utilizes a very simple optical system, is light weight, low cost and not sensitive to normal vibration effects inherent in an airborne platform or atmospheric turbulence.

## Peninsu-Lab

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Fred D. McElroy, Ph.D., President  
Marilyn McElroy, Chief Executive Officer

Peninsu-Lab is committed to addressing the global challenges facing the agricultural, forestry and horticultural industries in an environmentally safe manner.

Biocontrol of Botrytis cinerea on Greenhouse Grown Conifer Seedlings, Ma-  
linda J. Fohn & Fred D. McElroy. Gray mold, caused by the fungus Botrytis cinerea, is responsible for significant losses of conifer seedlings. The goal of this project was to determine the feasibility of controlling gray mold of conifer seedlings by biological means. Fifty-nine bacterial, fungal and yeast isolates collected from healthy tissue associated with Botrytis infected conifer seedlings were screened on agar plates for ability to inhibit growth of selected Botrytis isolates. Four bacterial, two fungal, and two yeasts were evaluated as biocontrol agents on detached conifer needles and seedlings in a greenhouse setting. Two of the best biocontrol agents as determined by in vitro tests, Trichoderma hamatum and Cryptococcus laurentii, were evaluated in the greenhouse on Douglas-fir seedlings for ability to control two geographically diverse strains of Botrytis cinerea tolerant to two fungicides, thiophanate and iprodione. A single foliar spray of T. hamatum reduced Botrytis infection by 67% compared to Botrytis-only and the fungicide application. Applications of T. hamatum one day prior to inoculation with Botrytis and again 14 days later provided an 82% decrease in Botrytis infection compared to 76% in a similar treatment with thiophanate. Three applications of T. hamatum, C.



laurentii, and Bacillus megaterium at weekly intervals reduced a naturally established Botrytis infection of 7-month-old Douglas-fir seedlings by 33%, 50%, and 33% respectively. Similar treatments with thiophanate resulted in a 108% increase in Botrytis infection.

## Perii Systems Inc.

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John N. Irizarry, President and CEO  
William Clark, Director of Engineering  
John F. Dobstetter, Director of Sales

Perii Systems, Inc. is a developer of productivity enhancement tools in the areas of test and information management.

Perii Systems, Inc. SBIR Phase II program is developing, for the Army Research Laboratory at Fort Monmouth, two specific Microwave Hardware Description Language (MHDL) tools: A Test Requirements Document (TRD) Generator and an Automatic Test Equipment (ATE) Synthesis and Validation tool.

Test Requirement Documents (TRD's) are usually generated after the design has been completed, most often by hand. The TRD Generator tool assists the design engineer in generating the TRD by reading the MHDL description, formatting and extracting pertinent information in a configuration-controlled environment, and placing that data on applicable TRD forms (currently MIL-STD-1519A).

The ATE Synthesis and Validation tool allows instrumentation system engineers to automatically determine the necessary instrumentation requirements by extracting hardware signal and signal switching information from an MHDL hardware description. A library of test instrumentation and test station configurations is then accessed to automatically select the most appropriate test instrumentation. Differentiation between recommended versus "on-hand" test instrumentation can also be made.

User interface consists of standard Graphic User Interface (GUI) options including menus, dialog boxes, and WYSIWYG printing. In addition, portability to other platforms has been a design concept from the inception, and allows for ease of future portability.

Capabilities developed in SBIR Phase II must be packaged for marketability and some features must be added. The first is the ability to utilize design information from Hardware Description Languages (HDL's) other than MHDL; specifically the VHSIC Hardware Description Language (VHDL) which currently is in use and is supported by software tool vendors.

The product must be enhanced to provide the designer and test engineer with a "cradle to grave" solution for testing. Specifically, the ATE Synthesis and Validation Tool must be expanded to be able to control and communi-

cate directly with test equipment, thus creating an environment of complete design-through-test.

Additionally, the application must be ported to other workstation platforms to allow greater acceptability in the marketplace.

The overall goal is to provide a complete integrated environment for chip through system level testing of hardware description language designs. Initial efforts will focus on the areas described above. This approach will allow us, in the near future, to deliver a product to the marketplace that meets the market demand.

The revenues from product delivered will allow further development and evolution, including providing interfaces to multiple sources of hardware data (such as other Hardware Description Languages and standardized data exchange formats); enhancing testing and diagnostic strategies; interfacing to an increase number of testers via multiple interfaces (i.e., IEEE, VXI & MXI), and being able to use testing data for heuristic analysis to refine the Design/Testing process.

### Physical Optics Corp. - Applied Technology Division

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Dr. Gajendra Savant, Assistant Vice President

Dr. Tomasz Jannson, Chief Scientist

Mr. Jay Hirsh, Manager, Optical Communications

Company Purpose and Goals: To become a leading company in photonic technologies and a key market player in the areas of holographic components, fiber optic communications, and monitoring instrumentation.

Physical Optics Corporation's (POC's) Applied Technology Division has developed several novel electro-optic components and systems under SBIR programs. They include:

- Family of Wavelength Division Multiplexers (WDMs), (HoloMux<sup>®</sup>) for fiber optic multichannel communication applications;
- Analog/Digital Point-to-Point Link (HoloLink<sup>®</sup>) for single fiber RGB video extenders for computer workstations, and for multiplexing of composite video for process control and security;
- Antireflection Moth-Eye Coatings which are compatible with metal, plastic, semiconductor and composite surfaces. Applications include low observables and spectrometry where they can eliminate stray light noise and enhance signal transmission to the detector;
- High Density All-Optic Storage Disk based on birefringent polymer, applications include computer memory systems and image recognition systems;

- Family of Holographic Broadband Filters for eye protection, cockpit display, night vision goggles, broadband IR reflectors for space solar cell arrays, and for large near IR optical mirrors.
- Countermeasure Filters to protect sensors and delicate electronic systems from short wavelength lasers, applications also include spectrometry and chemical and analytical instruments, and
- Fast Switching Spatial Light Modulators (SLMs) based on electrically addressable holographic switching with birefringent liquid crystal modulation for smart filter application in optical correlator systems

Additional Development Needed: Technology scale-up and production development, process repeatability improvement, application specific designs.

Physical Optics Corporation (POC) would like team with potential end users; companies who have military and/or commercial applications for these technologies. POC is looking for strategic partner(s) interested in large scale production and commercialization

### Physical Optic Corp. - Research & Development Division

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Dr. Freddie Lin, Director, Photonics  
Mr. Lev Sadovnik, Group Leader, New Technologies

Company Purpose and Goals To become a leading company in photonic technologies and a key marketing player in the areas of holographic components, fiber optic communications, and monitoring instrumentation.

### Physical Sciences Inc.

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Merlin Miller, Vice President, Applied Technology  
Peter Nebolsine, Manger, Innovative Technology

The mission of the corporation is the successful development and commercialization of high value technical products and services.

Physical Sciences Inc. (PSI) is a corporation dedicated to exploiting a diverse Research and Development base to develop commercial technologies and entities. Our corporate headquarters, including a 20,000 sq ft fully equipped, state-of-the-art laboratory, are in Andover, MA with subsidiary operations in Alexandria, VA; Hunt Valley, MD; and San Ramon, CA. Phase II Project information will be available on:

- A fast oxygen atom system for space material testing
- A fluorescence imaging system of detecting contamination on surfaces
- An iodine standard lamp
- Aerospace testing services including a fully automated planar laser induced fluorescence systems
- Automatic laser parameter control for retinal photocoagulation
- Smart medical laser feedback control
- Convective/radiative heat flux gauge system
- Optical diagnostic for measuring the vorticity in fluid flows
- Compact hydrogen maser using a HTSC cavity
- MW 140 GHz gyrotron oscillator using a coaxial cavity
- Neural net retrieval of meteorological data system

## Power Spectra

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Michael I. Gamble, CEO  
Edward Lamb, Controller  
Jeannie Wu, Vice President, Administration  
Jeffrey Oicles, New Business Director  
David Russi, Program Manager

Power Spectra's mission is research, development, and manufacturing of power gallium arsenide semiconductions. Our prime goal is to move several R&D products to the manufacturing stage.

New power gallium arsenide switching capabilities are emerging as a result of Power Spectra's efforts as supported by SBIR and other contracts, and under internal funding. Resulting products are now moving from R&D into pilot manufacturing. Most applications are presently military, with several commercial possibilities identified for the longer term.

Power Spectra has completed two relevant SBIRs; a Phase II effort on high current switching for ordnance fuzing applications and a Phase I study on high current ohmic contact on gallium arsenide. We are presently proposing

a Phase II contact development which will result in an advance solid-state, photonically activated switch of interest to the ordnance fuzing community. We are now marketing existing, lower current versions of this switch in optical pulser modules. These miniature hybrid packages can provide short optical pulses with several hundred watts of peak power. They have wide commercial applications in laser radar for machine vision, range finders and automotive guidance.

**Additional Developments Needed** None of major significance required for most applications, current and/or voltage scaling required for some potential product lines. Achieving high reliability in a cost-effective manufacturing environment is perhaps the most challenging task.

Power Spectra is a small, high technology company specializing in power gallium arsenide. We are largely R&D oriented. Volume manufacturing is our goal, preferably for a commercial market. The present mainstay of the company is the bulk avalanche semiconductor switch (BASS), a photoconductive device largely developed over the past four years under funding from The Boeing Company. Targeted military markets for the BASS include electronic warfare, radar and communications. Some commercial radar applications have also been identified, and we are currently focusing much of our attention towards conceptualizing as many more as possible.

In order to diversify and enter nearer-term markets, Power Spectra has teamed for the past year with a technology development partner to develop a new gallium arsenide switching technology. This work is independent of our alliance with Boeing but can take advantage of in-house semiconductor processing capabilities installed in support of the BASS Program. The technology enables laser driver/optical pulser products as discussed above. Pilot production has already commenced.

Key to our early success with this new product line is an alliance with yet another partner, a component manufacturing specialist. In return for marketing and product recognition through the use of his logo, this partner is rapidly gaining access to module and system markets heretofore denied him. Since we have been a component customer of this partner for years, it has been relatively easy for both parties to transition to these new roles.

Further current and voltage scaling of both the BASS and newer, derivative devices will open up further opportunities for which there is no present competition. This is a long-term goal with major growth potential in both military and civilian markets.

### Program Development Corporation of Scarsdale, Inc.

300 Hamilton Avenue, Suite 409  
White Plains, NY 10601  
Tel (914) 761-1732  
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Peter R. Eiseman, President

There is a great need to integrate Computational Fluid Dynamics (CFD) into the engineering design process in a cost effective way. The typical complex

geometric configurations have been the limitation. The goal and purpose of our products and services is to overcome those limitations and to profit economically in so doing. In this direction, we have created powerful grid generation and manipulation tools and integrated some into a CAD system.

Program Development Corporation (PDC) develops and supplies software that connects computational fluid dynamics (CFD) and computational electromagnetics (CEM) with simulations for complex geometric configurations. That connection is accomplished with the generation of a grid to appropriately cover the resultant complex region with points. The generation process is the well known obstacle to a more routine design process using CFD or CEM.

The SBIR work has resulted in two primary product lines. The most recent one is a multiblock grid generation scheme with automatic zoning. The other one is a grid modeling scheme. The automatic zoning product is called GridPro™/az3000. This has been seen by others as producing higher quality grids than ever expected and doing so more automatically than ever imagined. The grid modeling products, GridPro™/sb3000 (sb3005, sb3010, sb3015, and sb3020) are seen as novel extension of CAD like tools for grid manipulation. It is the first product of its kind and benefits the user by providing dynamic real time grid modification to rapidly perform design variations or to more accurately resolve flow field features in an interactive adaptive sense.

While the products are currently marketable entities, there is a well defined path to grow to products stream. This growth is for the base technology and for its integration into the matrix of computational engineering. Engineering software typically evolves to progressively gain more capability. These are clearly too numerous to itemize in a short space. The important point in our case is that we currently have two major marketable product lines.

From the point that SBIR Phase II research commenced, there has been an emphasis in bringing products to a marketable form without waiting for the conclusion of Phase II. In the case of grid modeling (Phase II from Eglin AFB), a single block product was formed without waiting for the more general multiblock modeler. The single block grid monitor has been given a great deal of polish while the general multiblock version can be similarly polished for future product additions to the line. The personal computer grid generator (Phase II from AFOSR) was also brought out during Phase II. It addresses the small business and educational marketplace and is priced accordingly. The most recent product is the general multiblock grid generator with automatic zoning (Phase II from NASA Lewis). Like the other, there is a well established direction for refinement, embellishment, extensions, and integration with other products.

During the Phase II period, product brochures and user manuals were created as well as the initiation of advertising. The direct advertising has been in trade journals that engineers and scientists read for their general (not specific) information. To date these have included Mechanical Engineering (ASME), Aerospace America (AIAA), NASA Tech Briefs (magazine plus card deck), and SIAM News (SIAM). These have produced leads worldwide. Our response amounts to mailings of brochures and follow up telephone calls. The volume of this also points to a need for sales staff which we do not have.

Given that we are a very small company in need of more power in marketing and sales, we have formed a number of alliances. This includes Control Data, CHAM, Amtec Engineering, and NREC. These alliances represent op-

opportunities for sales by other entities; they do not provide financial backing for our direct sales, marketing, and product development efforts. While the benefits from these alliances will grow in time, there is still a need for further alliances particularly from those which can infuse some capital into the company to fuel our direct efforts. This will be important to capture a sizable portion of the market. The size of this market can be estimated to some degree by the number of upper end CAD installations as well as the population of computational engineers. The CAD systems represent the platforms from which our technology can be expected to grow into through a process of integration. We are interested in relationships which can vary from purely monetary to those where direct technological benefits are also present.

## Prometheus Inc.

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Email: jbyrnes@cs.umb.edu

James S. Byrnes, Ph.D., President, Principal Scientist  
John Benedetto, Ph.D., Principal Scientist  
Paul Abrahams, Ph.D., Principal Software Engineer  
Manfred R. Schroeder, Ph.D., Principal Scientist  
Donald J. Newman, Ph.D., Principal Scientist

**Company Purpose and Goals:** To provide excellence and experience in mathematical, engineering, systems, statistical, and computer science support to science and industry.

**PONS Image Coding and Transmission:** We have developed a signal processing algorithm which utilizes a totally different approach and philosophy. We transform a high resolution signal of any dimension into the sum of many low resolution signals of the same dimension, where each of these low resolution signals contains essentially the same amount of energy. Therefore, in a sense, each of the individual low resolution signals contains all of the information. Whether this "all" is sufficient depends upon the particular application. In some cases, just one or a few of these low resolution signals are enough to allow recognition of the original signal, so that it may be possible to perform automatic target detection/recognition with considerable data compression. Localization is another important feature of the algorithm. It is a trivial matter to employ it to focus on any portion or portions of the signal, while the remainder stays "fuzzy." This also enables significant data compression. Perhaps the ideal application of the new algorithm is to the geonential transmission of a signal over a low bandwidth channel, whereby exact reconstruction at the receiving end can be achieved if desired.

Although our proprietary algorithms already have the capability to solve important problems heretofore considered impossible, there remains room for both

improvement in code speed and efficiency, and implementation on special-purpose hardware.

We wish to form an alliance with a strategic interested partner that has the capability to recognize the promise in our ideas, the laboratory facilities to assist us in final product development, and the marketing muscle to make our joint venture a commercial success. We are open to discussion concerning the exact structure of this alliance.

## Q-DOT, Inc.

1069 Elkton Drive  
Colorado Springs, CO 80907-3579  
Tel (719) 590-1112  
Fax (719) 590-1125

Thomas E. Linnenbrink, President, Technical Director

Q-DOT pursues electronics research in data acquisition and signal processing as a means of developing products for both governmental and commercial applications.

Q-DOT seeks to commercialize several technologies evolving from its Phase II SBIR program. Several data acquisition and signal processing technologies are offered either as products or as the basis for products. These include a low-cost VXI-based transient recorder capable of acquiring 40K samples of 1 GHz bandwidth data at 5 Gs/s to 10-bit precision. Low-power, monolithic floating-point, analog-to-digital converter (a/d) spans a 15-bit linear equivalent range at rates up to 5 Ms/s. A micropower monolithic a/d is aimed at hand-held, battery operated voice conversion. A high precision delta-sigma will convert 50 MHz data at 100 Ms/s to 16- to 18-bit precision with 105 dB SFDR. Our radar simulator processor technology, currently configured as a FIR filter with 256 complex 12-bit taps to operate at 1 Gs/s with 400 MHz bandwidth, may be applied to other filter and equalizer applications. A high-speed camera system acquires pictures with 512 x 512 pixel resolution at 10,000 frames per second. Other imaging systems include on-chip signal processing such as edge-enhancement. Beyond this demonstrated technology, Q-DOT is seeking research and development alliances to develop entirely new products for commercial applications.

Q-DOT, Inc. is the research arm of Q-DOT Group, Inc., a holding company. Products will be developed by other entities also under Q-DOT Group. To date, these include Q-DOT Phototonics, Inc. (imagers, cameras, optical computing elements), Q-DOT Communications (radio components, filters, equalizers), Q-DOT Instruments (recorders, signal generators), and Q-DOT Converters (low-power a/d and d/a, high-speed a/d and d/a, high precision a/d and d/a). We are currently seeking strategic alliances with companies which have established sales, distribution, service, etc.



## QRDC Inc.

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P.O. Box 562  
Excelsior, MN 55331  
Tel (612) 470-6964  
Fax (612) 470-6964

Dr. Daryoush Ailaei, CEO

The main mission of QRDC is to perform Mechanical Engineering related research, development, and consulting services in response to the needs of the U.S. government and commercial segment. Our long term goals are to contribute to the advancement of basic science and engineering and to develop QRDC-made products (engineering hardware and/or software) to market to both government and commercial industry.

In the treatment of the dynamic problems of structures, two alternate testing methods, based on external and embedded sensors, exist in the literature. If the sensors respond to the changes in the dynamic characteristics of the structure, and/or the environment, then they are referred to as "smart" structures. Smart sensors and smart materials have been used for detecting structural damages and/or controlling the vibration characteristics of the structures. Recent developments in new materials, and in vibration phenomena, such as mode localization and transition, have made the researchers look for ways of combining the two in order to more effectively alter structural response. The objective of this Phase II project is to develop more efficient and precise smart structures based on smart materials such as shape memory alloys, advanced sensors such as optical fibers, vibrational phenomena such as loci crossing and veering, and mode localization and transition. In particular, such phenomena will be enforced on the structures so that the undesired vibrations are confined to a smaller region, and therefore easier to detect and control. Optical fibers and shape memory materials will be used to detect and control the parameters that are more crucial in vibration response of the structure. Such a combination will result in a huge reduction in the number of the sensors, significant gain in computational speed, and improving the accuracy of the control system.

Six potential prototypes (hardware and software) will be the outcome of this Phase II project. The developed technology has a wide range of applications in both government and commercial products. Additional developments are needed to customize the developed technology to various applications.

We have been looking for partners to help us to develop our technologies (financially or otherwise) since the end of Phase I. QRDC's general strategy in collaboration with others is to apply the technology to their products in exchange with the use of their facility and/or expertise. The benefit to such interested parties will be their access to the state-of-the-art technology during its development stages. In this Phase II project, for example, Martin Marietta, Alliant Techsystems, and McDonnell Douglas have offered to help us in various parts of the project and in return we apply our technology to their identified problem(s) with the goal of having a significant impact in the improve-

ment of their products. QRDC welcomes alternative methods of collaboration and investment.

### Ribbon Technology Corp.

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Blacklick, OH 43004  
Tel (614) 864-5444  
Fax (614) 864-5305

Lloyd Hackman, President

Company Purpose and Goals: Funding of direct strip casting for titanium foil

The objective of this project is to develop a commercial processing method for the production of titanium alloy foil

Phase II is designed to develop a refined production method for using plasma arc melt overflow rapid solidification technology to produce titanium aluminide strip and to process that strip through pack rolling or direct rolling into titanium aluminide foil. Both alpha-2 and gamma based titanium aluminide, as well as an additional titanium alloy, will be produced with the improved plasma arc process to be optimized in Phase II and these materials will be subjected to direct rolling and pack rolling optimization experiments

### Rocky Research

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Boulder City, NV 89006-1800  
Tel (702) 293-0851  
Fax (702) 293-0854

Uwe Rockenfeller, Ph.D., President  
Lance D. Kirol, Chief Engineer  
Paul Sarkisian, Program Manager

Company Purpose and Goals: Commercialization of solid state complex compound chemical compressor technology in consumer, commercial and industrial markets.

Rocky Research developed a non CFC/HCFC/HFC refrigeration technology based on solid state chemistry complex compounds. The technology employs solid metal salts and ammonia refrigerant in "chemical compressors" which are heat driven.

Over the past 6 years the company designed and built various laboratory prototypes which are now operational units showing promise for cost effective refrigeration, heating, thermal energy storage and heat pumping. The concept can be employed in the temperature range -80F to +550F for commercial, industrial and consumer products. A total of over 40 product applications suitable to the generic chemical compressor technology have been identified in

which the no-moving-part technology can be used showing first and/or operating cost advantages over vapor compression technology.

Current developments focus on small refrigerator and freezer appliances, HVAC products and industrial refrigeration. The key development by Rocky Research is the breakthrough in heat and mass transfer technology of the solid-gas compounds which led to a five-fold equipment size reduction compared to other sorption type systems. Several field test activities for industrial products are underway and consumer appliances are being operated in Rocky Research's laboratory.

**Additional Developments Needed** Development from laboratory to production prototypes and manufacturing processes, packaging and marketing

Rocky Research is looking for strategic partner in order to form a venture or licensing relationship for the manufacture and sales of complex compound chemical compressors as well as specific novelty appliances if required. Name-brand consumer product companies have reviewed the technology and agreed to use and buy chemical compressor hardware if available at suitable conditions and quantities.

The partner is expected to invest into the final development of the products and into manufacturing facilities and marketing. Rocky Research has a package of intellectual property including numerous patents and know-how, prototype hardware, a client base for chemical compressors and is staffed to complete the development work.

### Sandia Research Assoc., Inc.

3411 Candelaria NE  
Albuquerque, NM 87107  
Tel (505) 881-6900  
Fax (505) 883-5700

Steven M. Shope, President  
Richard Watson, Vice-President, Engineering  
Laura Shope, Vice President, Administration

**Company Purpose and Goals:** Research and development specializing in underwater acoustics, underwater archeology, GPS electromagnetics, and software development.

A wireless communications link for torpedoes or similarly-launch weapons is being developed in this Phase II SBIR research project. The link will transmit power and communications signals across a small gap. The concept will work in harsh environments that preclude conventional radio and optical techniques. The link is based on an innovative electromagnetic induction technique. A major advantage of this method is that power can be transmitted across the link. The induction technique is robust and can operate at high data rates in spite of alignment errors and large link separations. Foreign objects in the path, including sheet metal and seawater, do not affect its operation. Replacing existing hard-wired umbilical-type connections with the induction link will result in higher reliability, faster weapon loading, and cost sav-

ings. In addition to torpedoes, this communications method has applications in any type of short-range communications link where hard-wiring is not feasible. Examples include launch platforms on surface ships, airborne launch platforms, underwater connectors, etc. Monitoring sealed containers or vessels is another potential use.

Approximately seven more months of development is required to complete the advanced prototype phase of this project.

Sandia Research Associates, Inc. is seeking a joint venture partner to assist in marketing and sales of this technology.

## Science Horizons, Inc.

710 Encinitas Boulevard., Suite 200  
Encinitas, CA 92024  
Tel (619) 942-7333  
Fax (619) 942-1652

J. Theodore Cherry, Ph.D., President  
Mary Jane Cherry, V.P., Sales and Marketing  
Charles A. Bergan, Division Manager, Software Engineering  
Kevin P. Crigui, Division Manager, Systems Engineering

Science Horizons' product line, the AQUINAS open computing environment, provides a modular solution to your data acquisition and processing requirements. This system is the cornerstone for the conversion of analog to digital data and for the acquisition, processing, and real-time analysis of that data. The AQUINAS environment is designed so that it is easily customized to fit your operational and research requirements. Our goal is to produce a data acquisition and processing environment whose only limitation is your imagination.

Science Horizons' current SBIR Phase II project is the construction of a rugged, miniaturized, low cost, seismic station for deployment in third world environments. The design is based on the Analog Interface Module (AIM), a 24-bit digitizer that is user programmable, the DSP-EB, a DSP board for high-speed signal processing, the CIM, a general purpose communications processor that provides remote users with open access to the digital data, and AIMOS, an operating system which controls the data flow between these modules and schedules user downloadable processing programs for execution by the DSP.

While this design is for an open, GSE station, it is by no means limited to that specification. In fact, the AIM/DSP/CIM/AIMOS environment is an extremely powerful platform for the generation and acquisition of digital data from single station, arrays, seismic networks and for the implementation of very sophisticated signal processing programs that perform on-site analysis of that data.

While the project is for the construction of a GSE open station, what we will develop is not only open, but has the possibility of being "smart," i.e., a smart open station limited only by the user's imagination.

Science Horizons would be happy to discuss our current product line and our future plans for new products with companies who wish to work with us to achieve our goals. Mutual non-disclosure agreements would be required.

## Scientific Computing Associates, Inc.

One Century Tower  
265 Church Street  
New Haven, CT 06510-7010  
Tel (203) 777-7442  
Fax (203) 776-4074

Beverly E. Thalberg, President  
Dr. Andrew H. Sherman, V.P. Technology  
Leigh D. Cagan, V.P. Marketing and Business Development  
Dr. Robert Bjornson, Research Scientist  
Dr. Daya Atapattu, Research Scientist

SCIENTIFIC seeks to deliver easy-to-use Linda (R) programming environments, innovative software applications, and in-depth expertise which enable technical and commercial users to achieve competitive advantage through parallel computing in production environments. SCIENTIFIC's SBIR-funded products are used today in a wide variety of industries, from petroleum, pharmaceuticals, aerospace, and semiconductors to insurance and financial services. Products now in development will multiply added value in these industries and enable the productive, cost-effective use of parallel computing by new users in other industries.

SCIENTIFIC has several software-based SBIR-funded technologies with high commercial potential: (i) Fault-tolerant parallel and distributed computing systems which enable application portability across multiple architectures together with dynamic, adaptive resource allocation in hierarchical and heterogeneous desktop-to-MPP LAN/WAN environments, (ii) intelligent database systems which employ advanced algorithms and query-based learning capabilities to identify and manipulate data patterns, trends, and relationships within large archival scientific and commercial databases, and (iii) process trellis-based realtime monitoring systems which provide user-friendly frameworks for filtering, diagnosing, and formulating high level interpretations of continually changing data streams in multiple domains; these may be applied to such areas as insider trading detection within the financial services industry, patient monitoring within the health care industry, and network monitoring within the telecommunications or power generation/distribution industries.

Additional Development Needed: Please contact company for this information on specific projects. For certain proprietary information, a non-disclosure agreement with the company may be required.

SCIENTIFIC is eager to explore a variety of potential Phase III funding source arrangements in the form of joint ventures, business partnerships, and/or strategic alliances. In addition to providing Phase III funding, the company values very highly partnership with sponsors who can help leverage

SCIENTIFIC's SBIR commercialization efforts through other forms of support. These may include internal use of SBIR-funded products by the sponsor, integration or bundling of standard or custom versions of SBIR-funded products with sponsor products, external distribution by the sponsor and its channels, or other market-driven dimensions of added value. Commercial products resulting from such collaborations may also, or in some cases perhaps exclusively, be sold and supported by SCIENTIFIC.

### Sciteq Electronics, Inc.

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San Diego, CA 92123  
Tel (619) 292-0500  
Fax (619) 292-9120

William Lennartz, CEO  
Henry L. Eisenson, President  
Bar-Giora Goldberg, Chief Technical Officer  
Janet Handzel, Engineering Manager

Sciteq's mission is the design and production of advanced-technology frequency synthesizers.

Developed for the U.S. Army's Harry Diamond Labs (now Army Research Lab), and under the leadership of Barry Scheiner, the objective of Sciteq's Phase II SBIR effort was the design and production of the next generation linear FM (chirp) generator for use in military synthetic aperture radar (AR). The technology is also applicable to commercial SAR, seekers, vehicle collision avoidance, airborne radar, test equipment, simulators, and other applications. Conventional linear FM technologies are analog and use expensive linearized and temp compensated voltage controlled oscillators yet the resulting linearity is poor. Sciteq's approach synthesizes a new frequency (locked to a precision reference) each two nanoseconds, thus creating a chirp signal with linearity never before achieved - and therefore elevating system performance dramatically. Using direct-digital synthesis techniques involving a novel double accumulator developed by Sandia, a patent-pending memory developed by Sciteq, and an advanced digital-to-analog converter developed by a consortium of which Sciteq is a member, the result meets expectations and is deemed a success. The unique signals generated by Sciteq's prototype Digital Chirp Synthesizer have never before been available to the electronic industry, and their availability now creates important opportunities in growing industries.

Phase II ended with the successful production of working prototypes, each housed in a conventional 19" electronic chassis. Since the technology is now proven, the next step is packaging in a form that expands the utility of the system. Sciteq suggests that a "universal chirp synthesizer engine" be developed, using hybrid packaging, thus making the chirp synthesizer applicable to vehicle radar, "synthetic vision" for aircraft, and similar commercial markets.

A joint venture should be formed with Sciteq providing both technology plus access to the required gallium arsenide parts, and with the second partner providing both funding to develop a hybrid/commercial product plus commercial marketing and sales to subsystem manufacturers and end users, including vehicle and aircraft manufacturers, etc.

### SEAKR Engineering, Inc.

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Torrance, CA 90503  
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Fax (310) 542-3207

Raymond E. Anderson, President  
Scott Anderson, Vice President  
Eric Anderson, Vice President

Company Purpose and Goals: Manufacturer of Aerospace Memory Systems.

SEAKR Engineering, Inc. and Spectrum Sciences, Inc. have teamed to perform the Phase II development of an aircraft Solid State Flight Data/Voice Recorder (SSFD/VR). This recorder will have a non-volatile Flash EPROM memory encased in a stainless steel crash survivable ball. As an option, this same memory can be installed in a remote unit which is deployed in the event of a crash. The SSFD/VR will have the capability to record both Flight Data and Cockpit voice. The SSFD/VR design will be modular so that features such as data encryption or additional sensor inputs or voice channels can be provided simply by adding more modules. Tests will be performed to demonstrate capability for qualifying for both military and commercial requirements. A pre-production SSFD/VR will be delivered to the Navy for flight testing.

Additional Development Needed: Qualification of recorder to commercial specifications and setting up production capability.

The next step in a Phase III strategy is to pursue opportunities with the Navy V-22 and other Navy aircraft requirements.

The first step is to market the recorder to the companies bidding on the Joint Primary Aircraft Training System (JPATS).

This will be followed by marketing to commercial aircraft manufacturers such as Boeing and McDonnell Douglas.

To accomplish this a joint venture with an avionics manufacturer/marketer could prove useful.

### Seer Systems, Inc.

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Tel (412) 682-6441  
Fax (412) 682-6470

Harry E. Pople, President and Chief Scientist  
Martha J. Trondle, Administrative Officer  
William Spangler, Cognitive Scientist  
George H. Pople, Software Engineer

Company Purpose and Goals: Development of real-time computer software that can track transient behavior in complex systems and provide time-oriented interpretations of what fault or succession of faults might account for the observed behavior, and render procedural guidance concerning recovery management.

The principal product of this SBIR is EAGOL, an artificial intelligence based system for real time fault diagnosis and recovery management involving complex engineered (and eventually, biological) systems. In Phase 2, the emphasis has been on extending the EAGOL causal model to include an enriched representation of the goals and intentions that might account for actions and interventions taken by safeguard systems or human operators — which are often critical to the understanding of a faulted system's state and possible trajectory. Because emergency operating (or "malfunction") procedures play an important role in determining such intentions, it is necessary for the EAGOL reasoner to have access not only to the procedures, but also to the rationale underlying the procedures. The goal structure of those analysts responsible for creating the malfunction procedures.

In a real-time environment, this model of procedure rationale allows EAGOL to explain to a human interactor why a procedure may be asking for a particular observation or action. More importantly, an understanding of the underlying steps in a procedure allows EAGOL to reason about procedure failures and suggest alternative actions. Certain 'safeguard' procedures, for example, include worst-case assumptions that may not be true in a particular circumstance. EAGOL is able to test for and possibly refute invalid or irrelevant assumptions. Under these circumstances, EAGOL can draw upon its less-constrained, goal-oriented model of the physical system for alternative approaches to solution of the problem.

Additional work is ongoing in the development of graphic user interfaces to support both real-time operations and knowledge-base development for EAGOL applications.

Insights underlying development of EAGOL originated in the Principal Investigator's studies of decision making in Internal Medicine (which led to development of INTERNIST and CADUCEUS); extensions to real time diagnosis and management have been based on studies of operator behavior in real and simulated emergency scenarios involving shuttle operations, nuclear power plant operations and critical care medicine. There are significant potential applications of the EAGOL technology in all of these arenas, and in others that exhibit similar characteristics: Complexity of systems, potential for costly or even disastrous malfunctions and significant prospect for "human error" in the management of unanticipated and emergency situations.

We seek strategic alliances with major players in the applications areas, with development and marketing of application primarily the responsibility of the cognizant partner. Seer Systems major role would be that of continuing de-



velopment and maintenance of the core technology, with consultation and collaboration in the development of applications provided as needed.

## Sentec Corporation

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Walled Lake, MI 48390  
Tel (313) 960-1020  
Fax (313) 960-1814

Takeo Sawatari, Ph.D., President

Company Purpose and Goals: Research Development and Engineering company to produce Hi-Tech products in the area of Optical Sensors.

The current optical sensor for the characterization of aerosol has marginal sensitivity and accuracy. A significant improvement of these characteristics has been demonstrated in a feasibility level developmental nephelometer during Phase I of the project A90-101. The improvements were achieved through the enlargement and reshaping of the optically sensitive volume of the system, and the increase of both the gain and the system signal-to noise ratio. Performance of the new design was compared to the current Army standard nephelometer, demonstrating the magnitude of the improvements in all pertinent characteristics required for the detection and analysis for both small particle, and long fiber aerosols.

The completion of the research and preparation for commercialization of the inexpensive high performance sensor system is currently under way under the Phase II project. The work is conducted on all aspects of the product by building engineering prototypes. Potential applications of the product other than DoD use include fog detection (airports and highways), air pollution detection (factories, hospitals, and large cities), and special product/process inspections.

For each specific application such as fog detection (airports and highways), air pollution detection (factories, hospitals, and large cities) and special product/process inspections, the product must be modified. The modification may be required, in some application, for both hardware and software of the sensor system.

Two primary options are being considered by Sentec for commercialization and financing. The preferred approach involves the arrangement of a strategic alliance. The alternative approach involves licensing of the product. These are discussed below.

Two versions of strategic alliances will be considered. The first and most desirable option for Sentec is the establishment of a strategic alliance with a firm well established in the marketing of technical products in the areas involved with the aerosol sensing unit. Under this alliance arrangement, Sentec would focus on the development of the product(s) and establish the capability for manufacturing. The strategic alliance partner would establish links to the market and pursue contingent orders. Manufacturing would proceed accordingly with funding moving from the stage of contingent orders (commer-

cial lending sources of funds based upon the contingent orders), to the stage of revenue based manufacturing/operations.

The second potential form of strategic alliance could be with a manufacturer/market oriented company that is involved with a "composite" product, that is a product which performs multiple functions, including aerosol sensing. Sentec would manufacture and provide the aerosol sensing unit as a sub-part of the total composite unit under contract with the strategic alliance partner.

The alternative approach, licensing of the product, could be used as a necessary alternative to the strategic alliance option, or potentially as an additional means to commercialization on a broad scale. Under this approach, manufacture of the product would be enabled by other companies for either independent device purposes or as part of their composite units. Clearly this provides a funding channel that requires less substantial investment by Sentec to commercialize, however, it moves the manufacturing operation outside Sentec. This is viewed by Sentec as a less desirable option.

## Software Compositions

P.O. Box 510477, 321 Ocean Avenue, Suite 6  
Melbourne Beach, FL 32951  
Tel (407) 952-0430  
Fax (407) 984-4303

Kathleen Gilroy, Owner

Company Purpose and Goals: Provide products and services meeting the needs of Ada and software reuse programs.

The overall objective of this effort is to apply maintenance tools and techniques to the problem of software reuse, exploiting the growing base of existing Ada software in the creation of new reusable components. Phase I resulted in a comprehensive method for applying an approach called Reuse by Transformation (RxT), and the specification of a toolset which would automate a portion of the method. Phase II is refining this method, and implementing a prototype version of the toolset. The Phase II toolset performs analyses of Ada software and actually transforms that software to make it more reusable and maintainable; it also assists in the integration of reusable software into an application. Possible benefits to users of this technology are to: Recoup investments already made in existing Ada software, to ease the cost and effort involved in maintaining and reusing that software, to reuse more software earlier, and to reduce the risk of programs involving software reuse. Significant life cycle savings over typical development and maintenance approaches are expected.

Phase III efforts will include improvement and commercialization of the toolset, and the development of training and conversion services.

Kinds of support which we are pursuing for Phase III include: Computer-aided software engineering (CASE) tool vendors interested in integrating RxT with their products and/or providing a marketing/sales vehicle for RxT; contractors and government agencies responsible for Ada development, maintenance or reuse efforts interested in using RxT to support their efforts (includ-

ing non-Ada to Ada conversions, and Ada 83 to Ada 9x conversion efforts); and venture capital investment in RxT product commercialization and evolution.

### Software Productivity Solutions, Inc.

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Indialantic, FL 32903-3112  
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Ed Comer, President  
Lois Valley, VP Sales  
Dr. Andy Rudmik, VP Engineering  
Richard Fox, VP Marketing  
Peter Dyson, VP Operations & Finance

SPS develops high technology software products that are easily applied by users to achieve measurable quality and productivity improvements.

### Sorbent Technologies Corporation

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Twinsburg, OH 44087  
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Sidney G. Nelson, President

Company Purpose and Goals: Supply proprietary processes, equipment, and services for the control of air pollution.

A new product developed and demonstrated in an Air Force SBIR Phase II project is the NOx-Plus Filter for removing NOx and other contaminants from exhaust gases. This product, developed specifically to control the emissions produced during the testing of jet engines in test cells, appears to have many promising applications, such as boilers, diesel engines, gas turbine engines, incinerators, and automotive vehicles. A prototype NOx-Plus Filter was installed on a jet-engine test cell at Tyndall AFB, where it exhibited excellent contaminant removals. This simple, low cost control technology achieved 40 to 83 percent NOx removal over a seven-month period. Other contaminants removed with the filter included particulates, CO, SO<sub>2</sub>, HC1, organics and toxic metals.

Many potential applications of the new technology exist. Sorbtech is currently looking for industrial and government sites requiring NOx control where demonstrations of the new technology can be carried out.

Sorbent Technologies Corporation (Sorbtech) has a strong patent position regarding the new technology. In addition to the Air Force's support, Sorbtech

has expended its own funds on this development. Sorbtech is a public corporation. It recognizes that it will need additional cash to commercialize the new technology and it hopes to obtain these funds through private placements or a new sale of common stock. Several foreign firms have already requested licenses to the new technology, and serious consideration is being given to foreign licensing. Sorbtech is open to potential joint ventures, partnerships, or strategic alliances.

### Spectral Sciences, Inc.

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Burlington, MA 01803-5169  
Tel (617) 273-4770  
Fax (617) 270-1161

Dr. Fritz Bien, President  
Dr. Michael E. Gersh, Vice President  
Dr. Lawrence S. Bernstein, Chief Scientist  
Dr. Mitchell R. Zakin, Principal Research Scientist

**Company Purpose and Goals:** Continuing innovative research in data analysis, computer modeling, experimental design, and gas analysis instrumentation leading to strategic alliances and licensing to Phase III manufacturers and marketers.

The TACOS gas sensor (Trace Atmospheric Carbon Monoxide Sensor) utilizes a species-specific technique for detecting low concentrations of carbon monoxide in air. Using Spectral Sciences patented line lamp technology, a beam of infrared energy unique to CO is produced. This beam is optically filtered and passed through a test chamber, which is continually sampling the atmosphere in question. Attenuation of the radiation indicates absorption by CO in the sample stream. The device has on-board digital processing using SSI-developed software to convert the degree of beam attenuation to CO concentration in the sample stream. The CO concentration is displayed on the built-in LCD panel and can be directed to a PC for long-term data acquisition and processing. The system, which is fully contained in a 10" x 8" x 5" box, can detect CO concentrations down to 1 ppm within 5%.

This instrument was developed for the detection of CO in the space station and could perform the same function in a submarine. A similar sensor was developed and successfully tested by the Air Force to detect HCl in rocket plumes. This technology is suitable for the detection of many other gases, including water vapor, HBr, HCN, NO<sub>2</sub>, NO<sub>3</sub>, CO<sub>2</sub>, NH<sub>3</sub> and small hydrocarbons such as acetylene, methane and formaldehyde.

Work is needed to adapt this technology to applications with other gases. Development needs include: The design of modular gas-specific conversion inserts, modification for commercial use, design for portability (battery operation), and manufacturing optimization.

Spectral Sciences does not want to develop a manufacturing capability, but would prefer to establish an alliance with a company that is already a known

factor in the gas sensor business. SSI would contribute existing proprietary technology and patents and would maintain involvement as a technical partner, both in new product development and product application. It would be expected that the partner would have manufacturing expertise as well as an established marketing and sales organization.

## Spectrum Sciences, Inc.

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Ronald J. Spicuzza, President  
Scott Styles, Sr. Engineer

Spectrum Sciences, Inc. and SEAKR Engineering, Inc. have teamed to perform the Phase II development of an aircraft Solid State Flight Data/Voice Recorder (SSFDR). See SEAKR Engineering for description.

At the end of Phase II a crash survivable Solid State Flight Data and Cockpit Voice Recorder will be available to both Military and commercial customers. This recorder will be small, more reliable, require less maintenance, and be less expensive than existing tape recorders. These recorders can be used in new aircraft developments such as the V-22 or can be used to upgrade existing aircraft such as the Navy's P-3 and F/A-18.

## Spire Corporation

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Roger G. Little, President  
Elizabetta Cortesi, Assistant to the President

Spire Corporation specializes in thin film technologies for biomaterials, optoelectronics, and photovoltaics. Spire's mission is to commercialize emerging technologies into growth markets through products and services.

This Phase II project, entitled "Development of 780nm and 792nm Diode Laser Pumps for Solid State Lasers," utilizes the MOCVD epitaxial wafer growth technology for growing quantum well structures to achieve the program goal of 50 watt emission per 1-cm wide laser bar. A total of 410 laser bars packaged in a single-bar, five-bar and twenty-bar arrays were delivered to NASA. Spire now offers both unmounted and mounted laser array bars for sale. Long-term reliability data show excellent stability. Applications of such arrays

include optical pumping of solid-state lasers such as Ho:Ti:YAG and Nd:YLF which can then be used in reliable and efficient ranging, communication, LIDAR, X-ray generation, medical and materials working systems. Additional applications include direct use of the high power diode lasers for IR illumination and various medical and ophthalmology systems.

Higher powers and different wavelengths are desirable. For example, visible 630-670nm lasers can pump tunable TiSAF and LiSAF solid state lasers and can be used in medical applications. Longer wavelengths at 870nm can improve Nd:glass laser performance.

High power diode laser array bars are needed by companies producing both military and commercial high power and low power solid-state laser systems. The high power end (kilowatts and above) is dominated by large systems such as x-ray lithography (Hampshire Instruments) and military communications and ranging (McDonnell Douglas Electronic Systems Co.). Spire is looking to provide these companies with either unmounted array bars or complete multibar assemblies. The low power end is dominated by smaller companies which specialize in custom systems which have the potential for large sales.

### Stottler Henke Associates, Inc. (SHAI)

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Dick Stottler  
Andrea Henke  
David Dodd  
Lori Stottler

Stottler Henke Associates, Inc. (SHAI), founded in 1988, performs artificial intelligence research and development for the government and private sector. Technical capabilities include planning and scheduling, neural networks, case-based reasoning, knowledge engineering and expert systems. Clients include NASA, National Institutes of Health, US Army Strategic Defense Command, Orlando Naval Training Systems Center, US Air Force, Naval Surface Warfare Center, US Army Construction Engineering Research Laboratory and various companies in the private sector.

#### Planning NASA Space Shuttle Missions:

SHAI has developed a very successful full-scale automated planning and scheduling tool for scheduling Space Shuttle processing in a Phase II effort for NASA, Kennedy Space Center. The tool, currently being used by mission planners, allows relevant domain knowledge to be entered by the planners themselves, making it extremely flexible. SHAI knowledge engineered experienced mission planners to identify relevant planning techniques, heuristics and data to be represented. This knowledge is captured from planners using a combination of rules and object-oriented representations.

#### Translation of an expert system into a Neural Network:

In a project for the Army Strategic Defense Command, SHAI developed a prototype which automatically translates an expert system into neural network form. Translation allows expert systems to derive the benefits of neural networks, including adaptability, improved real-time performance, fault tolerance and the ability to generalize. The neural network can be readily transitioned to a parallel processing machine and make full use of all its processors. Neural networks, which can be difficult to understand and design, become much easier to develop because of their expert system origin. Expert systems developed with IntelliCorp's KAPPA-PC expert system building tool are translated into neural network form which initially produce identical answers to the original expert system. These networks can then be trained to produce better answers.

#### ESTEEM:

SHAI developed ESTEEM, a commercially available CBR application development tool. ESTEEM is an economical, fully-featured software development tool for building decision making and problem solving applications which use reasoning on prior experience. ESTEEM's Case-Based Reasoning (CBR) methodology allows the capture and retrieval of encapsulated experiences and the knowledge to manipulate them.

While traditional AI approaches must explicitly model the complexities of a domain, ESTEEM avoids this problem by representing knowledge as cases, where each case consists of a problem and its solution. A problem can be solved by retrieving the solution to a similar problem and adjusting it for the current situation.

ESTEEM provides great flexibility in developing CBR applications. It offers general purpose case definition facilities, a wide range of developer selected similarity and retrieval options, techniques for incorporating rule-based inference for retrieval and case manipulation, the concept of nested case-bases, and specification of end-user functionality.

#### CBR for Manufacturing Bid Preparation:

SHAI produced a CBR system for the Air Force Materials Laboratory, to predict the resources needed to manufacture products. The prototype, known as Bidder's Associate, allows a bidder to describe the features of a particular part, choose similarity metrics, and retrieve similar parts which had previously been manufactured. The bidder can use the costing information associated with the manufacturing process to decide whether to bid on the new part and at what cost.

#### AEGIS Intelligent Tutoring System:

SHAI is currently developing for the Naval Surface Warfare Center an Intelligent Tutoring System (ITS) for the AEGIS Training Center. The system is based on the premise that students learn best by examples and that examples can be represented as cases. The system is an ITS based on CBR where the cases describe a problem, its solution, and the steps necessary to arrive at the solution. These steps reference principles that the student should learn. The system will be capable of course planning as well as remedial action based on test problems solved incorrectly by students. The cases are presented to students as animations of tactical simulations. The animation capability allows students to more fully experience the case.

#### Retail Sales Prediction:

SHAI is currently involved in a project to predict retail sales for a national chain of stores. Historical data are processed with a variety of AI techniques to predict daily sales volume for each individual store.

#### Environmental Knowledge Base:

Currently SHAI is developing an environmental knowledge base (EnvKB) for the Army Construction Engineering Research Laboratory. The EnvKB will allow facility designers and construction managers to consider environmental effects of their decisions. These environmental effects span the entire life-cycle of the building from construction material fabrication and construction, to operation and renovations, to building demolition.

### StratEdge Corporation

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Ronald Bub, President  
Candace Brown, Director of Finance and Administration  
Deborah Wein, Director of Technical Marketing  
Martin Goetz, Design and Test Engineer  
Paul Anderson, Project Engineer

StratEdge Corporation is committed to be a leading manufacturer of microelectronic packaging. We will achieve this through excellence in quality, technological innovation, and responsiveness to our customer's needs.

A high-performance single cavity millimeter wave (MMW) package was validated and a multichip module (MCM) was developed for MMICs. The research utilized the StratEdge Process, a co-lamination of fully fired ceramics, to fabricate the components. Fused silica was used as the substrate material for this program. Three separate package designs were fabricated: 1) Broad-band single chip carrier, 2) a multilayer, multicavity module, and 3) a phased array module with integral radiating elements.

Packaging is an important technology area that is essential for utilizing MMIC devices in systems. Unfortunately, packaging that provides good electrical thermal response is generally available at frequencies below approximately 12 GHz.

The module is built from several layers of fused silica laminated to a metal base. The structure is compartmentalized and will support four, 30 GHz, multi-bit, MMIC phase shifters that are mounted in individual, electrically isolated cavities. Multilayer interconnect is used to route the DC bias and control paths through vias down to layers beneath the RF substrate. The laminated structure is designed to incorporate end-fire radiating elements. Fused silica is used as RF substrate material to achieve low insertion loss. Overall dimensions of the 4-channel module, including end-fire radiating elements, are 1.0" x 2.0" x 0.1".



StratEdge has refined its electrical designs, such as 50 ohm transitions, and certain aspects of its process in order to fabricate the same module in lower cost and more manufacturable materials (alumina). The module would be more reliable and rugged. There are numerous space-based and airborne applications where the module could be used immediately.

StratEdge will retain its strategic alliance with NASA LeRC to promote application specific designs. In addition, NASA LeRC will provide extensive test and diagnostic facilities to validate the module and evaluate it for acceptance under the current ACTS program. Potential joint ventures will include aerospace firms such as Boeing, General Electric, Martin Marietta, TRW, or Westinghouse because of their interest in phased array radar. This type of millimeter wave MCM is also appropriate to use in upcoming commercial applications such as personal communications networks and automotive electronics where high level integration within a single module will be the most effective approach for packaging MMICs. Therefore, potential joint ventures with telecommunications firms and automobile manufacturers are suitable.

StratEdge Corporation will use its expertise to fabricate these high performance modules. The aerospace and electronics firms mentioned above can provide an array of designs for next generation systems. NASA LeRC can be retained under a Space Act Agreement for module evaluations and as a partner in design and applications.

### Structural Composites, Inc.

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Dr. Ron Reichard, CEO  
Scott M. Lewit, President  
Patricia A. Helbling, Exec. Vice President  
Eric Greene, Program Manager  
Neil Rohan, Dir. Mfg. Technology

Structural Composites, Inc. (SCI) is a privately held small business specializing in FRP composite structures and materials. SCI provides engineering, research and development, materials, testing, prototype development and fabrication technology support to government and industry.

SCI is in the final stages of an SBIR Phase II program to investigate the performance of composite materials in fires for naval applications. Issues addressed in this program include flammability, structural performance, extinguishability, smoke corrosivity and data management. Phase III work will expand upon the structural performance task, from which a test methodology and parallel theoretical modeling have been developed to characterize the thermal-mechanical response of composite structures.

The test methodology involves fire testing of FRP composite panels subjected to multi-plane loading. Panel structures were selected for evaluation

because this configuration is representative of decking and bulkheads, both of which are paramount to fire endurance in marine vessels. The majority of panels tested to date have been of sandwich construction. Thermocouples were laminated in place through the thickness of the panels to verify the thermal-mechanical finite element model under development. Ceramic insulation, two inches thick, is used in the panels to provide an even heat distribution with an E119 fire insult. Panels are subjected to constant loads during the fire testing, both in-plane and out-of-plane, using a multi-plane loading jig. The top edge of the panel is free to rotate, and the bottom is fixed. The out-of-plane load is applied via a round impactor with an area of one square foot. A constant load is maintained during the test by manually pumping the independent hydraulic systems to a prescribed pressure. This test scenario produces a situation that is analogous to a structure, such as decking, that must support live loads during the course of a fire.

Over 30 different panels have been tested as part of the SBIR Phase II effort. Our knowledge and data base could be greatly enhanced by expanding this test matrix to vary resin types, insulation schemes, laminate geometry, core and reinforcement materials, as well as process variables. Additional data would greatly assist designers, builders and certification agencies in providing fire-safe composite vessels.

A consortium of regulatory/design authorities (including the U.S. Coast Guard and various U.S. Navy agencies), shipbuilders and material suppliers, is envisioned to continue E119 testing of FRP composite panel structures with the multi-plane loading jig.

Preliminary discussions with the Coast Guard, Navy, material manufacturers and shipbuilders indicate that strong interest exists to continue research. As the data base of tested configurations increases, designers and regulators gain greater confidence in their understanding of the thermal-mechanical performance of composite structures.

## Symbiotics, Inc.

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Dr. Robert Paslay, CEO & President  
Dr. Richard Adler, Vice President, Advanced Development  
Mr. Robert Silva, Vice President, Product Engineering  
Mr. Theodore Chimiklis, Vice President, Sales and Marketing

Symbiotics, Inc. develops and markets software solutions for network computing problems in business, industry, and Government. Our products exploit object-oriented technology to connect applications easily across networks of heterogeneous computers, enabling developers to create and maintain complex distributed systems.

Distributed computing systems are proliferating, owing to the availability of powerful, affordable microcomputers and inexpensive communication networks. A critical problem in developing such systems is getting application programs to interact with one another across networks that incorporate heterogeneous kinds of computers and operating systems. NetWorks!™ is an innovative software product that provides an object-oriented messaging solution to these problems of remote interprogram connectivity. NetWorks! provides a generic "plug and go" software backplane for integrating existing (legacy) programs and new software applications. NetWorks! provides important advantages over alternative approaches such as RPCs and pipes. NetWorks! automates message-handling control. Communication is fully asynchronous (non-blocking with callbacks), which promotes efficiency and parallelism. NetWorks! supports peer-to-peer and group-oriented interaction models as well as client-server architectures. Finally, our object-oriented technology is particularly important in large-scale distributed applications, since it promotes reusability, maintainability, and extensibility. Application areas include remote database access, office automation, concurrent engineering, operations support/process control, decision support, workflow and workgroup computing.

Additional funding is desired to transition extensions to NetWorks! that are being funded under SBIR contracts into new products that are layered on top of existing NetWorks! development tools.

Symbiotics is looking to develop strategic partnerships with: Independent software vendors, who want high-level tools that will enable their applications to run in heterogeneous network environments; computer vendors, who will fund ports to their platforms to support the NetWorks! approach to peer-to-peer application connectivity on their platforms; and system integrators, who would use Networks! technologies to bid on and implement contracts for distributed systems.

### Systems Control Technology, Inc.

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John Pauly, Chairman and CEO  
David Elliot, Senior Vice President, Operations  
William Clark, Director, New Business Development  
Ron DeHoff, Manager, Maintenance & Logistics Systems Dept.  
Greg Gibbons, Manager, Intelligent Systems Dept.

SCT is an engineering research and development company that combines cutting-edge technology development with the fielding of sophisticated robust software systems, and provides engineering and support services in the areas of flight test, simulation, test and evaluation, mission planning, air traffic control, ASW, and maintenance and logistics systems.

### Application of Artificial Intelligence Technology to Surface Ship Torpedo Defense:

This project will provide a fieldable capability to interpret passive sonar data, using modern system architecture and Artificial Intelligence technology, to detect, classify and manage contact information of targets of interest. The technology is generally applicable to automated understanding of sensor data streams, converting sensor measurements into interpretation of the physical process being measured. The software shell used to implement this capability provides a powerful set of capabilities for developing other applications, and has been adapted to both sonar and interpretation of rocket engine instrumentation data for purposes of fault prediction and accommodation.

We would be interested in partners with specific, practical application needs who would support development of an economically significant system or systems which could be marketable products.

The software shell can be developed into a commercial product. It provides development tools, a comprehensive configuration management and documentation methodology, and generic development support for event driven blackboard expert systems. It complies with graphics and language standards and is fully portable and modular.

The sonar application is tailored to the needs of torpedo defense, but could be modified to apply to the automatic interpretation of sonar data in other tactical and surveillance sonar functions. Multiple streams of data can be integrated.

The system can be applied generally to monitoring and interpreting data streams. Examples are instrumentation of engines, production processes, drilling operations, etc. To build an application, one obtains the necessary input data streams, and provides rules and processes that relate observable phenomena in the data to understood phenomena in the physical process being observed. Monitoring trends and events in the physical process being observed makes it possible to diagnose developing faults or changing conditions.

SCT, Inc., under a Phase II SBIR contract to the FAA Tech Center, has been developing the Aviation Equipment Management System (AEMS) - a series of pen-based, intelligent computer applications for use by pilots and aviation maintenance personnel. Components of AEMS include the Flight Engineer's Assistant which supports information acquisition and electronic document delivery to the flight deck using a tablet sized, pen computer. The latest technology in mobile computing has been integrated into SCT's modular applications, including pen-centric, distributed databases, wireless networking and interactive technical data presentation. Additional modules including the Maintenance Engineer's Assistant and the Diagnostician's Assistant are being concurrently developed.

Users of this vertical application range from large airlines to small fixed base operators. The Phase II program incorporates flight test evaluation in several operational environments. AEMS consists of the pen-computing hardware, application software and special peripherals to add into an existing computer network at a user's facility. The system should increase the efficiency and productivity of aircraft operations and maintenance support for a variety of operators.

Software functions include electronic logbooks, checklists, service bulletins, fault isolation and expert system diagnostics, engine performance trending, and maintenance data and practices. The potential is being investigated for using this platform as an Electronic Library System data delivery terminal in the cockpit and on the ramp. Interfaces are being demonstrated to automated in-flight Monitoring Systems and Flight Data Recorders to support automated diagnostics and ground maintenance support.

Additional modules are planned to provide aircraft Electronic Library System (ELS) documentation support. ELS documents include all the paperwork generated to operate and maintain aircraft including flight crew, maintenance and passenger information.

SCT is interested in pursuing joint venture opportunities to market and distribute the system to airlines and operators. Additionally, we are seeking strategic alliances with aircraft and equipment vendors to incorporate the pen-based software technology into existing aviation equipment and products.

### TCAM Technologies, Inc.

33900 Curtis Boulevard, Suite #200  
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Edward Schneider, President

**Company Purpose and Goals:** Commercialization of a new class of actuators utilizing expandable Polymers (The TCAM Process). The many attractive features of TCAM actuators promises to displace many solenoids, gear-motors, and hydraulics market niches.

A radical new mechanical actuation system is proposed which projects many engineering improvements over state of the art power systems. Projected improvements include high power density and high stiffness linear actuators, high temperature ambient operation, easy manual control overrides, totally silent operation, simplified proportional automatic control electronics, improved fault recovery modes, low cost, and improved reliability. The system is based on thermally expanding polymers applied in the TCAM process, an acronym for ThermoChemically Expanding Motion. This process creates self contained hydraulic cylinder like end effectors which are electrically driven and do not require support equipment such as pumps, reservoirs, valves, etc. The TCAM process projects an order of magnitude improvement in hydraulic stiffness and operating pressures to 30,000 psi in a distributed actuator system which is electrically driven and not as vulnerable to central injury of pumps, valves, etc. The potential exists to develop actuators capable of 327 degree C. operation. Additionally, fuel based TCAM power systems and engines are projected which can capitalize on the high energy storage density of fuels for operating range improvements, eliminate cold and hard starting problems currently associated with internal combustion engines and reduce noise and heat signatures.

## Technical Research Associates, Inc. (TRA)

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Fax (801) 485-4997

Charles D. Baker, President and CEO  
Owen D. Brimhall, Engineering Division Manager  
Joseph K. Weeks, Advanced Materials Division Manager

TRA utilizes the Federal SBIR program to facilitate the transfer of technology from ideas to new products and unique solutions to technical problems.

TRA's goal is to become a Fortune 500 company within five years. Manufacturing and sales account for 90% of profit currently. TRA's revenue is 2.5 to 3.5 million dollars per year and increasing each year.

### Advanced Development of New Actuators for Human Sensory Feedback:

The development of actuators with enhanced capabilities is critical to the achievement of sensory feedback systems for intuitive, real-time human operations of telerobotic systems. The objective of this research project is to continue development of new actuators using active materials which will enhance the capabilities of dexterous, exoskeletal feedback systems for telerobotic applications. In Phase I, feasibility of the novel Terfenol-D driven actuators was demonstrated. The new actuators are efficient, responsive, small and exert relatively high forces. The actuators provide proportional forces and are easily interfaced with digital electronics because of low voltage requirements. Phase II will pursue advanced development of proportional force resistive brake actuators and active linear actuators. The actuator designs will be optimized, fabricated and integrated into a digitally controllable exoskeleton demonstration test bed.

This research has broad application; therefore, development will proceed on several fronts simultaneously, including: Virtual reality hardware, precise wide ranging optical actuators, exoskeletons on both fine human scale as well as large machine scale applications, and vibration damping requiring both small and large forces with unlimited stroke length.

TRA has started the Phase II program. With 18 plus months left on this project, Phase III partners need to be identified soon because of the diversity of the technology. TRA is soliciting knowledgeable hardware manufacturers to assist TRA in focusing on a product which will be beneficial to all parties. TRA is interested in the manufacture of some of this technology's products; i.e., optical bench devices. TRA prefers to work with established manufacturers who need fresh technology to enhance their position in the marketplace. TRA does not intend to launch into large manufacturing areas such as aircraft actuators.

## Technical Solutions, Inc.

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John R. Robbins, President  
Ailon L. Gilbert, Sr. Vice President  
George Ober, Vice President

**Company Purpose and Goals:** Development of technology and products for modeling, simulation, training, computer vision, and applications of technology to civilian and defense requirements.

Under multiple Phase II efforts, TSI has developed a family of tools for development and integration of distributed, interactive applications. First developed to support simulations, the tools provide such varied capabilities as inter-process communications protocols; graphics-based development of component and subsystem simulations (emulations) of functionality; on-line real-time data base management with message-based interface; rapid design, development and integration of operator control screens; on-line data dictionaries message protocol converters and gateways; control mechanisms for robotic components; simulation of systems and of combat; analysis tools for evaluation of functions and operation; and other related components. These tools are applicable to a wide variety of distributed applications including training systems, distributed interactive simulation, integration of machinery and analytical processes, etc.

A number of the tools are sufficiently mature to require little or no further development for initial release. Users manuals need to be developed. Depending upon target application environments, the user interfaces may need to be modified to be more "natural" to the intended user. Additional functionality will be developed over time. Some funds exist for improvements.

A relationship is sought with one or more companies focused on sales of products in, or development of applications for, specific distributed, interactive environments. Some examples include interactive training systems, distributed simulations of system and subsystem interactions with each other and a complex environment, integration of machines with intelligent and/or manned controllers, and similar applications. TSI would prefer to develop marketable product with sales and support provided by the larger company. Additionally, the larger company would develop applications of the product for sale.

Alternative relationships can be considered.

Also, TSI has developed substantial capabilities in Terrain Analysis and Display in support of military combat simulation. Their capabilities include complex displays, mathematical transformations from various USGS and DMA terrain data sets, analytical capabilities for reasoning on terrain, user interfaces, and other required functions. Funding exists for development of additional capabilities, including a special-purpose board set for support of terrain render-

ing and flat-panel display. These existing and future capabilities are directly applicable to problems in urban planning, land conservation, environmental analysis, and other Geographical Information system functions that require not only display capability, but analysis on the underlying terrain data. A low-cost GIS system with powerful features and hardware-enhanced options can be developed.

The existing capabilities need to be organized into various configurations addressing the requirements of specific classes of users. Some additional software functionality may be required, but is expected to be minimal. The board set required a revision to lower production costs and enhance functionality.

A relationship is sought with a larger firm that has national marketing capability and an interest in marketing Geographical Information Systems, particularly where such systems must reason about the terrain or perform analyses on the terrain. TSI would develop the final product in accordance with a mutually agreed product specification, and the larger firm would market and support the product.

Other relationships can be considered.

### Tec-Masters, Inc.

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Harriet M. Smith

### Telenexus, Inc.

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Wilfred K. Lau, President  
Richard Swanson, Vice President - Engineering  
David Fried, Director of Marketing

Company Purpose and Goals: To apply the latest technology in providing quality products and services in wireless voice and data communications.

The Telenexus TNEX-2000 is a flexible wireless communications system that provides robust local voice communication for virtually any work group. And because it uses spread spectrum techniques, no FCC site license is required to operate the system. The heart of the digital TNEX-2000 system is a micro-computer-controlled System Controller (SC) with customizable control software. Using both frequency and time multiplexing techniques, the SC supports up to 16 portable headset units. The portable units provide hands-free, full-duplex communications with more than 500 feet of range from the corre-



sponding radio unit which can be placed up to 1000 feet from the SC. The TNEX-2000 accommodates a wide range of selective calling requirements and prevents eavesdropping. Each portable unit has a unique two-digit ID number and a built-in keypad. The user can make a private call, create a conference call, join a conference call already in progress, and/or monitor conversations. The system can also be interfaced with up to 16 telephone, intercom, and/or other analog lines. Portable units can place and receive telephone or intercom calls whenever necessary. The system can be expanded further by interconnecting one or more System Controllers or by connecting directly to an existing intercom system.

For the next-generation products, additional development is needed in re-packaging the portable unit and in designing a new transceiver to increase system capacity from the current to more than 100 portable units.

We are currently marketing the TNEX-2000 to several government and industrial sectors. However, in this conference, we would like to seek joint venture partnership with major corporations to shape this product for used internally or for their respective industries. OEM/private labeling arrangements are possible. We also welcome strategic alliance in technology and market development.

## The Conference Center, Inc.

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Silver Spring, MD 20902  
Tel (301) 622-7795  
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Carl Jensema, Principal Investigator  
Daniel Hinton, Research Associate  
Corinne Jensema, President

The Conference Center, Inc. was established to provide research, training, and conference planning services related to special populations, particularly hearing impaired people.

We have three SBIR Phase II products:

- A computer sound cue board for hearing impaired people. This is a computer board which works with all ISA-bus, IBM-compatible computers. A cable with a light bar on the end attaches to the board and the light bar is mounted near the computer monitor to provide a visual representation of the sounds made by the computer.
- A telephone line status device. This electronic device attaches to a telephone line and uses LED lights to indicate the signal tones present on the line. Intended for use by hearing impaired people, but applicable to any situation where visual representation of telephone line status is needed.
- Materials for training 911 operators to handle calls from hearing impaired people. This includes a videotape, a training manual, and an interactive computer assisted instruction package.

Additional Development Needed:

- The sound cue board is completed.
- A basic line status device is completed. We are still working on a programmable line status device
- The 911 materials are in the final stages of development

The Conference Center is a research and development company. We are looking for a firm to take over marketing of the products while we continue to provide technical support and advanced development.

## Thermacore, Inc.

780 Eden Road  
Lancaster, PA 17601  
Tel (717) 569-6551  
Fax (717) 569-4797

G. Yale Eastman, Chief Technical Officer  
Richard W. Longsdorff, President  
Donald M. Ernst, Vice President Market Development  
Robert M. Shaubach, Manager/Development Operation

Thermacore is a high technology company dedicated to the technology of heat transfer, energy conversion and allied materials science. Thermacore is committed to the transfer of this technology to product development and eventual commercialization.

Particular products available for Phase III funding include:

Flexible Heat Pipe Cold Plates: This device provides passive cooling to military or civilian avionics.

Moving Gradient Heat Pipe Furnace: The product is a heat pipe based crystal growth furnace. Single crystal material is produced by implementing directional solidification.

Vacuum Leak Tight Composite Tubing: This tubing is intended to replace metal tubing used throughout spacecraft for such items like the thermal bus, plumbing and cryogenic lines, and heat pipe construction.

Thermal Bus Receptacles and Modular Cold Plates: These devices are for thermal control on space platforms.

Stirling Heat Engine Receivers: Stirling heat engines are being developed for use on manned or unmanned earth orbital and planetary surface missions. Sources of thermal energy are solar, nuclear, and combustion of fossil fuels. Liquid metal heat pipe receivers are used to couple these heat sources to the heat input section of the Stirling engine.

Implementation Strategy:

Flexible Heat Pipe Cold Plates: This product was initially developed for specific military applications. It has many other market potentials. The goal is to find a strategic alliance that would allow this product to find those markets.

Moving Gradient Heat Pipe Furnace: One of Thermacore's goals is to develop this furnace into a flight approved furnace for use in space. A partnership with a company that is experienced in this area is desired. A second

goal is to supply the crystal growth community with a versatile furnace. How the second goal might be achieved is not defined at this time.

Vacuum Leak Tight Composite Tubing: Our goal is to supply the Aerospace community with a lightweight alternative to metal tubing. Currently, this tubing can only be made on a laboratory prototype basis. Support is needed to transition this technology into a manufacturable product that would meet demand at a reasonable cost. The support is needed in both financial backing as well as developing the equipment to manufacture the product.

Thermal Bus Receptacles and Modular Cold Plates: Potential joint ventures between Thermacore and satellite component manufacturers is the logical link of this thermal management technology to the space commercial market

## TRI

7325 Oak Ridge Highway  
Knoxville, TN 37931  
Tel (615) 690-5600  
Fax (615) 690-2913

H. Lee Martin, CEO  
Daniel P. Kuban, COO  
Steve D. Zimmermann, CTO

TRI has a patented video device with applicability to military, medical, security, and consumer applications.

Omniview™ provides video pan, tilt, rotation, and magnification with no moving parts via electronic image transformation.

Advantages: Small volume operation, instantaneous response, highly reliable, multiple images simultaneously from a single video source.

Applications: Covert surveillance, endoscopy (medical or industrial); remotely operated vehicles, consumer interactive television, video teleconferencing.

Omniview is patented (US 5,185,677.3C, Japan Pending).

Additional Development Needed: Product interfaces and field implementation testing (FCC)

TRI seeks joint opportunities to exploit the target applications. Desired partners would provide distribution networks, development capital, inventory financing and potentially manufacturing (mass) expertise.

## TRI/Austin

9063 Bee Caves Road  
Austin, TX 78733  
Tel (512) 263-2101  
Fax (512) 263-3530

Dr. Alan Bray, President

Mr. Frank Hill, Vice-President  
Dr. Gary W. Carrivean, Head, Reliability Engineering  
Mr. John Bulluck, Head, Materials Sciences  
Dr. George Matzkanin, Director, NTIAC

TRI/Austin conducts sponsored materials and non-destructive test R&D projects, failure analysis and laboratory testing services including Accelerated Life Testing (ALT), product evaluation, and reliability engineer services for industrial and government clients. This employee owned company has approximately 150 employees. Technical disciplines include physics, chemistry, engineering, mathematics, materials science, computer science, and environmental sciences. Active in the SBIR Program for over ten years, TRI/Austin has won over a score of SBIR Phase I contracts from both defense and non-defense government agencies. Work is currently underway on three Phase II projects, two for the DoD and one for the Federal Highway Administration. All of these projects deal with materials development and testing with novel applications of coatings and adhesives. They capitalize on experience that TRI/Austin has gained over many years employing accelerated life and reliability testing and laboratory failure analysis. Future benefits from commercialization of products resulting from these projects may certainly be realized, both by a variety of government agencies and the private sector. TRI/Austin is actively seeking project partners, strategic alliances, and teaming arrangements for these and future programs.

### Triangle Research and Development Corporation

P.O. Box 12696  
Research Triangle Park, NC 27709  
Tel (919) 781-8148  
Fax (919) 781-8483

David P. Colvin, President  
Virginia S. Colvin, Vice President  
Richard A. McKinney, Business Manager

TRDC conducts research and development for government and industry in technologies that have potential for commercialization and with arrangements that give the company long term proprietary positions. Any business arrangements with other entities that meet these goals will be of interest to us. Some of these that we have experience with include "spin off" corporations, joint ventures, license agreements, and marketing/distribution arrangements.

While many small companies specialize in relatively narrow areas of endeavor, TRDC conducts research and development for innovative technologies in several diverse fields. Some of the most promising products/technologies are:

- Encapsulated phase change materials (PCMS) used in various ways for thermal control (for instance, wax microparticles encapsulated in polymer shells). Among many potential uses, two promising ones are two-compo-

nent fluids to cool engines, computers, etc.; fabrics that protect against heat or cold.

- Fiberoptic vision systems for heavy vehicles (tanks, trucks, buses) that replace or supplement the old rear/side-view mirrors and greatly increase driver visibility and overall safety.
- An advanced electro-optical microscope that is full color, real time, and high resolution—a superior tool for pathology, hematopathology, cytology, and other disciplines.
- Radio-controlled marker lights for use in helicopter landing and personnel extraction operations to provide visible or covert navigation during normal, night vision, or FLIR operations.
- A program of water survival training for use in emergency water exit from sinking craft.
- A new robotic vision method that greatly enhances a robotic system's ability to identify objects.

The amount of development still needed depends on the specific area. Some technologies are patented; some have and some have not been entered into commercial relationships with other entities. Interested parties should stop by the TRDC booth and inquire about specific technologies.

Any business arrangements with other entities that allow TRDC to maintain proprietary rights of the technologies will be considered. Possibilities include joint ventures, licensing agreements, marketing/distributing arrangements, and spin-off corporations. Some specific strategies are appropriate for the individual technologies being developed at TRDC. Some examples: Encapsulated phase change materials - specific applications have been licensed to other companies or are committed to joint ventures, but the commercial potential of other uses remains uncommitted; Fiberoptic vision systems will preferably reach the market through a licensing agreement with a concern that has a stake in the end-use (i.e., manufacturers of trucks, buses, military vehicles, trucking companies, and so on); The advanced electro-optical microscope - an agreement with a microscope maker or marketer, a joint venture with the manufacturer of the components of the instrument, or a strategic alliance with a computer company/communications company would all be appropriate avenues for commercialization. A good avenue for commercializing the water survival training system would be to collaborate with a joint venture partner experienced in training/education services. A similar strategy for the radio-controlled marker lights might look to the manufacturers of military and/or commercial landing systems for a cooperative agreement. The new robotic vision system might form a relationship with the makers or users of automatic storage and retrieval systems (warehousing, part position verification, inventory control.)

## Turbulence Prediction Systems

3131 Indian Road  
Boulder, CO 80301  
Tel (303) 443-8157  
Fax (303) 443-8234

H. Patrick Adamson, General Partner  
Brent Hight, Marketing Director

TPS' plan is to develop independently or in cooperation with others, infrared instruments for scientific, industrial and aviation related applications. The goal, once development is completed, is to license the product(s) to others to manufacture and distribute.

The specific product developed under the SBIR Phase II was an Advance Warning Airborne System (AWAS). The AWAS is an aircraft mounted system that provides the flight crew with advance warning of Low Level Wind Shear (LLWS) and Clear Air Turbulence (CAT) ahead of the aircraft. The AWAS provides a minimum of 10 seconds advance warning of LLWS and 4 minutes for CAT.

The AWAS was successfully flown in research flights on the University of North Dakota Cessna Citation and on the NASA B 737 research aircraft. The AWAS was also flown successfully in revenue service flights for over 10,000 hours on American and Northwest Airlines. It has an estimated MTBF of 18,000 hours (MIL 217E).

The AWAS is an automatic (programmable) non-cooled passive infrared spectrometer that is lightweight (91 lbs) with a low power requirement of 18W @ 28VDC.

The technology developed for the AWAS can now be expanded to provide not only for the warning of hazardous weather but for the actual visualization of weather phenomena as well as wake vortex, volcanic ash and CAT. It can also be applied for the remote sensing of air temperature, water vapor, pollution, cloud measurements, and sea surface measurements.

It is the intent of TPS to team with an avionic and/or weather monitoring/surveillance company for the purpose of mutually developing instruments for specific applications and also to continue the development of more advanced instrumentation.

## Utilix, Inc.

P.O. Box 991  
Greenville, NC 27834  
Tel (919) 752-0886  
Fax (919) 752-3922

C.J. Cain, President  
D.W. Paterson, Sr. Tech.  
Consultation by:  
P.A. LoChance, Consultant  
R. Genova, Consultant  
NC State University, Consultants

Company Purpose and Goals: To provide real-time metering technology and equipment to electric, gas and water utilities via advanced telephony.

Since June 1992, UTILEX, Inc. has been demonstrating true real-time metering of electricity in a highly successful field trial in North Carolina. In this trial we are routinely obtaining not only direct meter dial readings, but also continuous five-minute demand profiles from ordinary residential watt-hour meters and over ordinary telephone circuits, using no load recorders. From our test site in a high lightning and salt-spray area we have collected over 40,000 error-free responses from twenty-seven meter sites, and are obtaining 1100 more every two days. No load recorders or special meters are needed because our innovative telephonic technology provides full, uninterrupted communication with any meter at any time, even while the customer's telephone line is in use, whether for voice, fax, modem or answering machine. No other technology permits access to the meter site while the telephone line is in use, providing utilities with important new operating and revenue information and new service opportunities while significantly reducing the cost of equipment at the meter site. UTILEX technology is completely unobtrusive to the customer, to the meter, and to the telephone system; is compatible with AT&T's Utility Telemetry Trunk (to which we can add busy-line signaling capability); and fits well with planned changes in telephone systems such as FTTC, FTTH, ISDN, and optical fiber. Early projections suggest costs competitive with conventional AMR equipment.

To ensure suitability for real-life utility service, UTILEX seeks to expose its prototype equipment to a broader range of environments, types of service, and installation characteristics. We also wish to refine and miniaturize our present equipment and to develop ancillary products to support various utility applications of our technology.

UTILEX seeks appropriate investing partners from the electric, gas, water and telephone industries. The company will arrange for the contract manufacture of its products, then sell its telephonic equipment through unregulated telephone subsidiaries and utility-related equipment (e.g., its direct-reading dial encoder) directly to utility companies. Detailed plans are available under confidentially agreement.

### Valley Forge Laboratories, Inc.

6 Berkeley Road  
Devon, PA 19333  
Tel (215) 688-8517  
Fax (215) 688-8143

Dr. James J. Schuster, P.E., President  
Michael Boyle, Vice President

Valley Forge Laboratories, Inc. is a civil engineering firm providing services in the areas of: Construction quality control; laboratory testing; environmental, geotechnical and transportation engineering; and R&D services. Our goals are to obtain a licensing agreement(s) and to expand the R&D into development, evaluation and product testing of lightweight aggregate for the licensee(s).

The product developed through the SBIR/DoE Phase II Project is a lightweight synthetic aggregate made from the waste products of coal fired utilities and industries. The end uses of the product in the construction industry are significantly lighter in weight, approximately 30%, than those made of traditional natural stone aggregate. End uses are: Structural reinforced concrete beams, columns, walls (retaining, support and noise), highways, bridge decks, abutments and fill material. The lightweight end uses require less structural requirements for occupied space and is very adaptable for rebuilding the infrastructure.

Compared to our lightweight synthetic aggregate, natural stone is 50% heavier with insignificant higher strength in the end use and has a comparative cost.

The lightweight synthetic aggregate is produced from the waste products of coal-fired plants owned by electric generating stations and manufacturing plants. Disposal of these wastes is often accomplished by using landfills (\$50. to \$70. per ton) plus transportation costs. In the U.S. 60% of the electrical power is from the burning of coal, the nation's most abundant energy resource. There will be no shortage of the waste products in the future.

The product is attractive to companies that specialize in the manufacture and supply of construction related products and to utilities/plants that have costly waste disposal.

The mode for commercialization of our product is licensing, either with one or more licensing agreements. It is our intent to be the R&D organization for future testing, analysis and evaluation for the licensee(s), either directly for them, utilities or for the end user. The licensee(s) is envisioned as a major firm specializing in the manufacture and supply of construction industry products. Interaction would occur between the licensee(s) and the waste material sources, utilities and manufacturing plants.

ViaSat, Inc.

6120 Paseo Del Norte  
Carlsbad, CA 92009  
Tel (619) 438-8099  
Fax (619) 438-8489



Mark Dankberg, President, CEO  
Tom Carter, Vice President Engineering  
Jim Collins, Vice President Government Business Development  
Larry Taylor, Manager, Washington Operations  
Andy Paul, Vice President, Operations

**Company Purpose and Goals:** Development and manufacture of advanced digital communications equipment. Emphasis on modems, voice and data networking and information security - especially for UHF, SHF, C-band and Ku band satellite systems.

ViaSat has over 10 current SBIR Phase II and Phase III programs. Phase II technologies include small, affordable Demand Assignment Multiple Access (DAMA) user modems and network controllers for 5 kHz and 25 kHz UHF satcom; a C<sup>3</sup> RF Environment Simulator producing over 1000 high fidelity emitters at radio frequencies from 3 MHz to 22 GHz; Time-Of-Day VME-card embedded INFOSEC device; advanced Navy Tactical Data Links; Copernicus/TADIXS satellite networking; Command and Control network for Unmanned Ground Vehicles; Artificial Intelligence Tool for Trusted INFOSEC/COMPUSEC network design and analysis; and Voice and Data network integration. These programs are primarily DoD oriented. DoD customers include USAF ESC, US Navy SPAWAR, NAVAIR, NAWC, and NCSSC; US Army TACOM, MICOM, and LABCOM. We have also transitioned successfully to commercial products. ViaSat technological benefits involve improved performance, decreased physical size, reduced cost, or a combination of these. ViaSat has proven capabilities in transitioning SBIR Phase II technology into volume manufacture of commercial satellite, commercial Line-Of-Sight radio, and medical signal processing products.

Our requirement for additional development varies from program to program. Some products (e.g. UHF satcom DAMA modems and C<sup>3</sup> Environment Simulator) have already received Phase III funding and are available "off-the-shelf." Many products or technologies are best suited for custom integration into larger platforms or systems. Customer funding is typically required for those applications.

ViaSat has established a number of strategic relationships to develop or exploit our SBIR technologies. Typically these relationships are teaming agreements with DoD prime contractors. Examples include Lockheed-Sanders, Magnavox, McDonnell-Douglas, Motorola, Rockwell, and TRW. We have negotiated contracts to transition SBIR technology into very cost-effective, application specific products for commercial customers such as Fairchild, Harris, STM, and 3M Corporation. ViaSat is a hardware equipment supplier in every case. Our customer/teammate integrates our high leverage, high technology component or subsystem into a larger communications or signal processing product or system. ViaSat is actively seeking new partnerships for both DoD and commercial communications business. We are open to a number of creative business relationships including teaming, partnerships, joint ventures or investments. ViaSat contributes key products, technology, exceptionally talented personnel, and established customer relationships. Partners contribute financing; marketing or distribution channels; or complementary technol-

ogy or products. ViaSat has also teamed successfully with large companies to capture and develop new SBIR programs.

### Virus Reference Laboratory, Inc.

7540 Louis Pasteur  
San Antonio, TX 78229  
Tel (210) 614-7350  
Fax (210) 614-7355

S.S. Kalter, President  
R.L. Heberling, Vice President

Company purpose and goals: Provide viral diagnostic service to community and develop diagnostic tests.

The Virus Reference Laboratory, Inc. (VRL) as a virus and other esoteric infectious disease diagnostic reference laboratory is interested not only in providing the medical community with a laboratory diagnostic service, but in improving the methodologies employed. Recognizing that there was a need for methodologies that were relatively simple and could be used in the non-laboratory setting, a procedure that satisfied these criteria was developed during Phase I and II of the SBIR program. Essentially the procedure, a dot immunobinding assay (DIA), a modified EIA, makes use of a nitrocellulose sheet rather than a plastic matrix for binding antigens. Blood or serum (plasma) is applied to antigen sites via filter paper strips. After appropriate incubation, a conjugate followed by a substrate is applied and the test read by visualization of the color change. The value of the procedure lies in its use in the field, as no laboratory equipment is required, and the ability to simultaneously test for antibody to multiple antigens.

### Wormser Development Co.

24 High Street  
Marblehead, MA 01945  
Tel (617) 639-4406  
Fax (617) 639-4406

Alex Wormser, President

Company purpose and goals: The commercializing of a high-value concrete block we've developed made from coal powerplant residues.

Wormser Development Co. has developed a process for converting the residue from coal-fired powerplants into a high-value concrete masonry block. The block uses only the residue from fluidized-bed combustor plants and conventional coal-fired powerplants; no cement or other purchased materials are used. The precisely-made fine-grained block are self-aligning and glued in place, eliminating the high cost of installation with mortar. As a result, the cost of masonry wall assemblies is cut 25%, while the profitability of block

manufacturers is increased severalfold and the profitability of the utility power-plants is raised by 5 mils per KWH. The new product represents a profit potential to its participants of \$1.2 billion per year in the near-term and \$9 billion per year eventually. The profit will be shared between the utilities, block manufacturers, customers, and Wormser Development Co.

A \$3.2 million four-year commercialization program is required to obtain code approvals for the new product and demonstrate its long-term durability. A limited partnership is being formed to obtain the funding for the program from public and private sources.

The company hopes to fund the development program primarily with Department of Energy funds. A competitive solicitation directed at increasing the utilization of coal-powerplant residues has been issued by DoE, and the company has responded with a Proposal. Contracts for the multi-year program will be completed by fall. Cost-sharing funds for the DoE program are being sought from state research agencies, as well as industrial partners who stand to benefit from the new product. Funding will be channeled through a limited partnership agreement, in which both government and private investors will serve as limited partners, and Wormser Development will be the general partner. The private investors will also be granted sales agreements for the disposal of the residue (in the case of utilities) and franchise agreements (in the case of the block manufacturers). The company also seeks investors in the general partnership who will share in future profits through ownership of the mixing plants. The mixing plants will process the residue and provide other services needed to support the new product, including quality control, brokering the residue, and marketing support for the block manufacturers.

### W.W. Gaertner Research, Inc.

140 Water Street  
Norwalk, CT 06854  
Tel (203) 866-3200  
Fax (203) 838-5026

William M. Hawkins, President  
Christopher W. Gaertner, Engineering Manager  
Frank Perron, Software Systems  
Frank Musso, Business Manager

W.W. Gaertner Research has developed an advanced virtual reality workstation, under two separate Phase II efforts, for highly interactive training and education applications.

A fully integrated virtual reality workstation / training system has been built using state of the art sub-assemblies. WWGRI has taken a novel approach in its implementation of a V.R. system. By matching the performance of the components in the system and bundling them in a tightly coupled architecture, a low cost, high fidelity, and easily programmable machine is made possible.

Now users who were traditionally forced to purchase separate components and "use" them together have an alternative. Time can be spent on developing applications instead of getting different vendors' devices to talk to one another. The only interface that the programmer has to be concerned with is Windows NT running on a i486 computer or soon to be released P5.

The WWGRI system is actually comprised of many different processors including i860s for graphics generations, TMS320C30 DSP for head tracker calculations, and the i486/P5 for host control. All communication between these assemblies is transparent to the end user via a high speed 300Mbyte/sec backplane.

Applications include: Simulation - low-cost simulators; education - abstract theory - visualization of complex phenomenon; training - mission rehearsal; command and control - three dimensional battlefield visualization; and entertainment - gaming.